U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF ENTOMOLOGY.
BULLETIN NO. 31.

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CATALOGUE

OF THE

EXHIBIT OF ECONOMIC ENTOMOLOGY

AT THE

WORLD'S COLUMBIAN EXPOSITION,

CHICAGO, ILL., 1893,

MADE

UNDER THE DIRECTION OF THE ENTOMOLOGIST.

(PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE.)

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1893.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF ENTOMOLOGY,
Washington, D. C., June 17, 1893.

SIR: I have the honor to transmit herewith, for publication as Bulletin No. 31 of this Division, a catalogue of the exhibit made by the Division of Entomology at the World's Columbian Exposition.

Respectfully,

C. V. RILEY,
Entomologist.

Hon. J. STERLING MORTON,
Secretary.

CLASSIFICATION FOR CATALOGUE.

Sec. 1. Insects injurious to agriculture.—Exhibits 1–658.
- (*a*) Regular series, including corn and cotton. (1–602.)
- (*b*) Special series for wax material. (603–654.)
- (*c*) Anatomical models of insects. (655–658.)

Sec. 2. Systematic and biologic entomology.—Exhibits 659–713.
- (*a*) Systematic series.—Samples. (659–670.)
- (*b*) Biologic series.—Samples. (671–681.)
- (*c*) Show material. (682–709.)
- (*d*) Solidago exhibit. (710–713.)

Sec. 3. Silk insects.—Exhibits 714–721.

Sec. 4. Professional exhibit.—Exhibits 722–787.
- (*a*) Collecting apparatus. (722–750.)
- (*b*) Rearing apparatus. (751–773.)
- (*c*) Apparatus and methods of mounting and preserving. (774–787.)

Sec. 5. Insecticides.—Exhibits 788–907.
- (*a*) General exhibit. (788–865.)
- (*b*) Patent insecticides. (866–907.)

Sec. 6. Insecticide apparatus.—Exhibits 908–1032.
- (*a*) Nozzles. (908–995.)
- (*b*) Machines. (996–1032.)

Sec. 7. Official publications of the U. S. Entomologist.

Sec. 8. Illustrations, maps, and charts.—List.

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INTRODUCTION.

By C. V. Riley.

The following catalogue of the exhibit made by the Division of Entomology, Department of Agriculture, for the World's Columbian Exposition at Chicago, has been prepared with a view of increasing the usefulness of the exhibit from an economic and educational standpoint, and is intended to supplement the exhibit by giving such information regarding each separate item as the articles themselves do not convey or which it was impossible to give upon the limited space of the labels accompanying each specimen or article exhibited, though these have been made as full as circumstances would permit. In the preparation of the catalogue and of the exhibit itself I have had the aid of Mr. C. L. Marlatt, who has been particularly charged with the work, and whose assistance I take pleasure in acknowledging.

The exhibit of the division is intended to illustrate the work that has been done in applied entomology, viz, the investigation of the history of injurious insects and the devising of suitable remedies to prevent their injuries; also the work of building up and maintaining a large and valuable national collection of American species, and incidentally the representation of exotic insects for purposes of comparison. The intimate connection of the Department of Insects of the National Museum with the Division of Entomology has justified me, as honorary curator of said Department in the National Museum, in combining this last feature with the exhibit of the U. S. Department of Agriculture, and, to avoid duplication, I have, with Prof. Goode's approval, confined the Museum exhibit to an exposition of the characteristics of the families of American insects.

Certain prominent and interesting exhibits of an entirely novel character in the line of entomological illustration have also been made, the leading features of which are wax models of the host plants. While a number of plants have been thus modeled, I have designed to thus represent more particularly two of the most important and characteristic of the economic plants of North America, viz, cotton and Indian corn; and one, which, as the most conspicuous and widespread of the floral forms which add beauty to our autumn scenery, is,

perhaps, the most characteristic from the æsthetic side. I refer to the Golden Rod, which is also of great entomological interest from the vast number of insects which either nourish from it or are attracted to its bloom.

Another feature of the exhibit is a rather extensive and very showy collection of insects, chiefly South American, which is presented to give some idea of the nature and extent of the insect fauna of the tropical regions of this hemisphere. Many of these species, collected by Mr. H. H. Smith, are undescribed, and as the names of these exotic forms would be of little service even where they could be given, and as they are exhibited for other reasons, no attempt has been made at classification or determination. This is to form the showy portion of the exhibit, and, with the Solidago display, appeals to the love of the beautiful in contrast with the remainder of the exhibit, which is scientific or educational and has been arranged with little regard to artistic effect.

The exhibit is made up of the following sections:

Section 1.—Insects Injurious to Agriculture.

This section of the exhibit comprises some 602 special exhibits, each of which is an object lesson and pictorial epitome of the life history of a single injurious species, including as far as possible the different stages of growth of the insect; the injury it does, with specimens; its enemies and parasites; the available remedies and preventives, and references to the chief articles where full information may be found. These references are principally to Government and State reports to which the farmer is most likely to have access. These exhibits are grouped together according to the plants or animals affected, and relate solely to orchard, field, and garden crops, the parasites of domestic animals, and household pests. A small representative collection of cases of insect enemies to forest trees has also been added.

Supplementing the above are exhibits representing specially injurious species of prime importance affecting particular crops, which are accompanied by wax models of the plants, showing the injury in contrast, for the most part, with models of the perfect plants displayed alongside. Noteworthy in this series are the special exhibits of the Hop Plant-louse (*Phorodon humuli*), and of the Chinch Bug (*Blissus leucopterous*), which include greatly enlarged models in *papier-maché* of the insects in different stages. The Fluted Scale (*Icerya purchasi*), which has been so prominent of late years in California, and its principal enemy, the Australian Ladybird (*Vedalia cardinalis*), which has so throughly destroyed or controlled the scale, are also represented in this series, together with enlarged models of the Vedalia. A number of anatomical models made by Dr. Auzoux (Paris), representing the Silkworm and Moth, Honeybee, and Cockchafer are also exhibited.

Section 2.—Systematic and Biologic Entomology.

This section of the exhibit is illustrative of the national collection, which is under my charge as honorary curator of the Department of Insects. It consists of a series of drawers representing samples of the systematic collection in different orders, and also of sample drawers of the biologic series, systematically arranged, representing the full life-history of the species which have been studied, whether of economic importance or not, and these will be interesting more especially to the student or professional entomologist. These are exhibited not as complete series, but as samples taken from the actual collection to illustrate the methods employed in the arrangement of the regular systematic and biologic series, and also to give the visiting entomologist an insight into the present status of the national collection. With this section is included the showy exhibit of insects chiefly from South America, referred to in the introductory paragraph; also the special exhibit of the Golden Rod with the insects which affect or frequent it.

Section 3.—Silk Insects.

This section includes a biologic exhibit, in some cases with specimens of the raw silk, of the more important native and foreign Lepidoptera, the larvæ of which spin silken cocoons, and which are or may be of value as commercial sources of silk.

Section 4.—Professional Exhibit.

What has been thus denominated is an exhibit of the apparatus used by the professional or the amateur entomologist in the collecting of insects and in their mounting, rearing, and preservation. This includes a full display of all the ordinary apparatus used for these purposes, of chief interest among which will be the series of different devices and methods for rearing insects, comprising a large variety of cages or vivaria, and breeding-jars of all sorts. Many of these are fitted with wax plants and insects, showing the exact methods followed in the work of the Division. This section gives a complete illustration of the implements, apparatus, and methods of work of the practical entomologist.

Section 5.—Insecticides.

This section comprises insecticide preparations which have proved of value in the work of the entomologist in the prevention or destruction of injurious insects. To make the exhibit as complete as possible some of the more valuable of the patented articles have also been included. The first part of the exhibit includes the important insecticides not covered by patents, some eighty samples being shown, of which a dozen or so are of supreme importance and fulfill all ordinary needs, the others being of only occasional value. The proprietary and

patented articles are exhibited without comment, for the reason that all practical requirements in the way of remedies are met by the use of unpatented substances shown in the first portion of the exhibit.

Section 6.—Machinery.

In this section are included the more important nozzles for the application of liquid insecticides and a few of the leading insecticide machines, the latter collection representing some typical forms, special prominence being given to the knapsack sprayers, and no attempt being made to show make a complete exhibit of all insecticide machinery. A feature of the nozzle exhibit is a series of trial nozzles which were made in the elaboration of the principle of the cyclone or eddy-chamber spray nozzle, which, with its modifications, is now in such general use in all parts of the world, and the original type of which has come to be known (against my own inclination) as the Riley nozzle.

Section 7.—Official Publications of the U. S. Entomologist.

This section includes as complete a file as could be secured of the official entomological publications issued by the national government, and comprises both the work of the Division of Entomology of the United States Department of Agriculture and of the United States Entomological Commission.

Section 8.—Illustrations, Maps, and Charts.

An exhibit has been prepared of all the entomological illustrations which have been published by me in an official capacity, either as State Entomologist of Missouri or as United States Entomologist, and also as chief of the United States Entomological Commission. These are grouped in two series; one, illustrations of North American insects, mostly from my reports on the insects of Missouri, and from my own drawings; the other, illustrations of North American insects, mostly from drawings made under my supervision by Miss Sullivan, in the Division of Entomology, U. S. Department of Agriculture. The illustrations of machinery which have been published by the Division and by the Entomological Commission, are also included in this section, but are exhibited separately with the exhibition of insecticide machinery. All these illustrations are mounted on large sheets, and have references to the publications in which they are fully described. With this part of the exhibit is also shown a series of maps and charts illustrating the range of important injurious insects on this continent, and a number of large solar prints illustrating the classification of insects, by means of charts representing the different orders and suborders by typical insects in their different stages of development. There are also charts of special injurious species, together with views representing the practical application of insecticides, and interesting views of

insect depredation. Most of the charts are photographed from originals used in my lectures more than twenty years since, and do not indicate, so far as classification goes, some of the later views adopted. Still another series gives interior and exterior views of the insectary of the Department, and interiors of the entomological rooms in the Department, and the National Museum.

The whole exhibit is intended to illustrate primarily the nature of the national collection of insects and the methods of work followed in the U. S. Department of Agriculture, and I have felt in preparing it that such a collection would be most likely to prove unique and not in any way duplicate what the different States as such may do in the same line.

U. S. Department of Agriculture,
Division of Entomology,
Washington, D. C., April 30, 1893.

CATALOGUE OF THE EXHIBIT OF ECONOMIC ENTOMOLOGY AT THE WORLD'S COLUMBIAN EXPOSITION.

SECTION I.–INSECTS INJURIOUS TO AGRICULTURE.

INSECTS AFFECTING THE APPLE.

(*Pyrus malus.*)

Injuring the Roots.

1. APPLE-ROOT PLANT-LOUSE.

Schizoneura lanigera Hausm.

REMEDIES: Kerosene emulsion under and above ground; scalding water poured freely about roots; bisulphide of carbon.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., pp. 55–63; Riley, 1st Rept. Ins. Mo., pp. 118–123; Comstock, Rept. Dept. Agric., 1879, pp. 258–259.

Injuring the Trunk.

2. APPLE BARK-BEETLE: PIN-BORER.

Monarthrum mali Fitch.

REMEDIES: Kerosene emulsion applied to the trunk to prevent oviposition; trap trees.

CHIEF ARTICLES: Fitch, 3rd. N. Y. Rept., p. 8; Saunders, Ins. Inj. to Fruits, p. 24.

3. PEAR-BLIGHT BEETLE: SHOT-BORER.

Xyleborus dispar Fab.
Syn. *Xyleboras pyri* Peck.

REMEDIES: Same as for No. 2.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 90–91; Saunders, Ins. Inj. to Fruit, pp. 143–144; Insect Life, vol. II, pp. 279–280.

4. ROUND-HEADED APPLE-TREE BORER.

Saperda candida Fab.

PREVENTIVES: Alkaline washes; soap; washing-soda; mixture of white-wash and Paris green.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 107–109; Riley, 1st Rept. Ins. Mo., pp. 42–46.

5. FLAT-HEADED APPLE-TREE BORER.

Chrysobothris femorata Fab.

PREVENTIVES: Same as recommended for No. 4.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 46–47; 7th do., pp. 71–79.

Injuring the Branches.

6. PERIODICAL CICADA.

Cicada septendecim Linn.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 18–42; 4th do., pp. 30–34; Bull. 8, Div. Ent., U. S. Dept. Agric.; Rept. U. S. Dept. Agric., 1885, p. 235.

7. OYSTER-SHELL BARK-LOUSE.

Mytilaspis pomorum Bouché.

REMEDIES: Kerosene emulsion; alkaline washes; linseed oil; scraping off the scales during the winter.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., pp. 34–53; Riley, 1st Rept. Ins. Mo., pp. 7–18; 5th do., pp. 73–96; Comstock, Rept. U. S. Dept. Agric., 1880, pp. 325.

8. SCURVY BARK-LOUSE.

Chionaspis furfurus Fitch.

REMEDIES: Same as given for No. 7.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill. pp. 53–55; Comstock, Rept. U. S. Dept. Agric., 1880, p. 315.

9. IMBRICATED SNOUT-BEETLE.

Epicœrus imbricatus Say.

REMEDIES: Spread a sheet beneath the tree, or use a curculio-catcher, jar the tree and branches, gather the beetles and destroy them.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 58; Comstock, Rept. U. S. Dept. Agric., 1879, pp. 249.

10. APPLE-TREE PRUNER.

Elaphidion villosum Fab.

REMEDY: Collecting and burning the fallen branches.

CHIEF ARTICLES: Peck, Mass. Agric. Repository, vol. v; Harris, Ins. Inj. to Veg., pp. 97–99.

11. APPLE-TWIG BORER.

Amphicerus bicaudatus Say.

REMEDY: Cutting off infested branches and burning.

CHIEF ARTICLES: Riley, 4th Rept. Ins. Mo., pp. 51–53; 5th do., p. 54; Popenoe and Marlatt, Rept. Ks. Expr. Station, 1888, p. 209.

Injuring the Leaves.

12. APPLE-TREE APHIS.

Aphis mali Fab.

REMEDIES: Pyrethrum; soap suds; kerosene emulsion; lye; tobacco water.

CHIEF ARTICLE: Saunders, Ins. Inj. to Fruits, pp. 121–127.

13. RESPLENDENT SHIELD-BEARER.

Aspidisca splendoriferella Clem.

REMEDIES: Kerosene emulsion; alkaline washes; mixture of sulphur and lime; hand-gathering of cases in winter.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1879, pp. 210–213; Brunn, 2d Rept. Dept. Ent. Cornell Expr. Station, p. 154.

14. APPLE-TREE BUCCULATRIX.

Bucculatrix pomifoliella Clem.

REMEDIES: Arsenical mixtures.

CHIEF ARTICLES: Riley, 4th Rept. Ins. Mo., pp. 49–51; Lintner, 1st Rept. Ins. N. Y., pp. 163–167; Brunn, 2d Rept. Ent. Cornell Expr. Station, p. 157.

15. APPLE COLEOPHORA.

Coleophora malivorella Riley.

CHIEF ARTICLES: Riley, Rept. Dept. Agric., 1878, pp. 48–50; Lintner, 1st Rept. Ins. N. Y., pp. 163–167.

16. EYE-SPOTTED BUD-MOTH.

Tmetocera ocellana Schiff.

REMEDY: Hand picking of the withered clusters of leaves in early spring.

CHIEF ARTICLE: Fletcher, Rept. Exptl. Farms, Can., 1891, p. 195

17. CHAPIN'S APPLE-LEAF SEWER.

Phoxopteris nubeculana Clem.

REMEDY: Collecting and destroying fallen leaves in the autumn.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1878, pp. 34–36.

18. OBLIQUE-BANDED LEAF-ROLLER.

Cacœcia rosaceana Harr.

REMEDIES: Arsenical mixtures.

CHIEF ARTICLE: Harris, Ins. Inj. to Veg., pp. 480, 481.

19. APPLE LEAF-FOLDER.

Teras oxycoccana Pack.

REMEDIES: Same as those used for No. 18.

CHIEF ARTICLE: Riley, 4th Rept. Ins. Mo., pp. 46–49.

20. RASCAL LEAF-CRUMPLER.

Acrobasis indigenella Zell.

REMEDIES: Collecting and destroying the crumpled leaves during the winter; arsenical mixtures.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., p. 34; Riley, 4th Rept. Ins. Mo., pp. 38–42.

21. APPLE-LEAF SKELETONIZER.

Canarsia hammondi Riley.

REMEDY: Hand picking.

CHIEF ARTICLE: Riley, 4th Rept. Ins. Mo., pp. 44–46.

22. SPRING CANKERWORM.

Paleacrita vernata Peck.

REMEDIES: Arsenical mixtures; trapping female moths in oil troughs or tar.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 460–472; Riley, 2d Rept. Ins. Mo., pp. 94–103; 6th do., pp. 24–29; 7th do., pp. 80–90; 8th do., pp. 12–22.

23. FALL CANKERWORM.

Anisopteryx pometaria Harr.

REMEDIES:
CHIEF ARTICLES: } Same as for No. 22.

24. LIME-TREE WINTER-MOTH.

Hibernia tiliaria Harr.

REMEDIES: Same as for No. 22.

CHIEF ARTICLE: Harris, Ins. Inj. to Veg., pp. 472–474.

25. ELM SPAN-WORM.

Ennomos subsignaria Hübn.

REMEDY: Syringing with Paris green.

26. CLIMBING CUTWORM.

Agrotis scandens Riley.

REMEDY: Bright tin collar about trunk.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., p. 76.

27. APPLE-TREE TENT CATERPILLAR.

Clisiocampa americana Harr.

REMEDIES: Collection and destruction of the eggs on the leafless twigs in autumn and winter and of the conspicuous nest during spring and summer.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 117–121; 5th do., p. 56.

28. CECROPIA SILK-WORM.

Platysamia cecropia Linn.

REMEDIES: Hand picking of larvæ; destruction of cocoons during the winter.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 385–389; Riley, 4th Rept. Ins. Mo., pp. 103–111.

29. WHITE-MARKED TUSSOCK-MOTH.

Orgyia leucostigma Sm. and Abb.

REMEDIES: Arsenical mixture; destruction of eggs during winter.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 367–368; Riley, 1st Rept. Ins. Mo., pp. 144–147; Bull. 10, U. S. Dept. Agric., Div. Ent., p. 29.

30. FALL WEB-WORM.

Hyphantria cunea Dr.

REMEDY: Removal and destruction of the webs.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 130–132; Bull. 10, U. S. Dept. Agric., Div. Ent., p. 33; An. Rept. U. S. Dept. Agric., 1886, p. 518.

Injuring the Fruit.

31. PLUM CURCULIO.

Conotrachelus nenuphar Herbst.

REMEDIES: Arsenites; collection of adult beetles by jarring.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., pp. 64–72; Riley, 1st Rept. Ins. Mo., pp. 50–62; 3d do., pp. 11–29; Riley and Howard, Rept. U. S. Dept. Agric., 1888, p. 57; Weed, Bull. Ohio Expr. Station, 2d series, Art. VI, p. 133.

32. TEN-SPOTTED XANTHONIA.

Xanthonia 10-notata Say.

33. INDIAN CETONIA.

Euphoria inda Linn.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., p. 40; Lintner, 1st Rept. Ins. N. Y., pp. 232–239.

34. APPLE MAGGOT.

Trypeta pomonella Walsh.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., pp. 29–33; Comstock, Rept. Dept. Agric., 1881, pp. 195–198; Harvey, Rept. Maine Agric. Expr. Station, 1889, p. 190.

35. CODLING MOTH: APPLE WORM.

Carpocapsa pomonella Linn.

REMEDIES: Trapping larvæ by applying bands to the tree; destroying infested fallen fruit.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 484–487; Walsh, 1st Rept. Ins. Ill., pp. 27–29; Riley, 1st Rept. Ins. Mo., pp. 62–67; 3d do., pp. 101–104; 4thdo., pp. 22–30; 5th do., pp. 46–52; 6th do., pp. 9–10; Comstock, Rept. Dept. Agric., 1879, pp. 253–255; Howard, Rept. Dept. Agric., 1887, p. 88.

INSECTS AFFECTING THE PEAR.

(*Pyrus communis.*)

Injuring the Branches.

36. PEAR PSYLLA.

Psylla pyri Linn.

REMEDIES: Alkaline washes; solution of soft soap and washing soda.

CHIEF ARTICLES: Slingerland, Bull. 44, Cornell Expr. Station.

37. SCURFY BARK-LOUSE.

Chionaspis furfurus Fitch.

REMEDIES: } See No. 8.
CHIEF ARTICLES: }

38 PEAR-BLIGHT BEETLE.

Xyleborus dispar Fab.

REMEDIES: } See Nos. 2 and 3.
CHIEF ARTICLES: }

39. FRUIT BARK-BEETLE.

Scolytus rugulosus Ratz.

REMEDY: Burning infested trees.

CHIEF ARTICLE: Forbes, 17th Rept. Ins. Ill., pp. 1–20, 1889–'90.

Injuring the Leaves.

40. TARNISHED PLANT-BUG.

Lygus pratensis L.

REMEDIES: Jarring very early in the morning; Kerosene emulsion; pyrethrum.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 200–203; Riley, 2d Rept. Ins. Mo., pp. 113–115; Rept. Dept. Agric., 1884, p. 312; Forbes, 13th Rept. Ins. Ill., p. 115.

41. PEAR-TREE SLUG.

Eriocampa cerasi Peck.

REMEDY: Hellebore.

CHIEF ARTICLE: Harris, Ins. Inj. to Veg., pp. 528–532.

INSECTS AFFECTING THE PEACH.

(*Prunus persica.*)

Injuring the Trunk.

42. ASPIDIOTUS ANCYLUS Putnam.

REMEDIES: Kerosene emulsion; alkaline washes.

43. PHLŒOTRIBUS LIMINARIS Harris.

44. FRUIT BARK-BEETLE.

Scolytus rugulosus Ratz.

REMEDIES: } See No. 39.
CHIEF ARTICLES: }

45. PEACH BORER.

Sannina exitiosa Say.

REMEDIES: Cutting out the larvæ late in the autumn or early in the spring; mounding around base; hot water; painting trunk with arsenites.

CHIEF ARTICLES: Riley, 1st Rept., Ins. Mo., pp. 47–50; Comstock, Rept. Dept. Agric., 1879, pp. 254–255.

Injuring the Branches.

46. PEACH BARK-LOUSE.

Lecanium persicæ Fab.

REMEDIES: Alkaline washes.

47. PERIODICAL CICADA.

Cicada septendecim Linn.

PREVENTIVE: } See No. 6.
CHIEF ARTICLES: }

48. NEW YORK WEEVIL.

Ithycerus noveboracensis Forst.

REMEDIES: Jarring as with No. 9.

CHIEF ARTICLE: Riley, 3d Rept. Ins. Mo., pp. 57–58.

Injuring the Leaves.

49. PEACH-TWIG MOTH.

Anarsia lineatella Zell.

REMEDY: Early pruning.

CHIEF ARTICLES: Lintner, 1st Rept. Ins. N. Y., pp. 151–156; Forbes, Trans. Wisc. Hort. Soc., vol. 13, pp. 26–29; Howard, "Insect Life," vol. I, p. 196.

50. BLUE-SPANGLED PEACH-MOTH.

Callimorpha lecontei Boisd.

REMEDIES: Arsenical mixtures; hand-picking.

Injuring the Fruit.

51. INDIAN FRUIT-FLY.

Ceratitis capitata Wied.

REMEDY: Collect and destroy fallen fruit.

CHIEF ARTICLE: Riley and Howard, "Insect Life," vol. II, pp. 5 and 80.

INSECTS INJURIOUS TO THE PLUM.

(*Prunus domestica.*)

52. HOP PLANT-LOUSE.

Phorodon humuli Schrank.

REMEDY: Kerosene emulsion.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1888, p. 93.

53. FRUIT BARK-BEETLE.

Scolytus rugulosus Ratz.

REMEDY: } See No. 39.
CHIEF ARTICLES: }

54. PLUM GOUGER.

Coccotorus prunicida Walsh.

REMEDY: Collecting and destroying fallen fruit.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., p. 72; Riley, 3d Rept. Ins. Mo., p. 39.

55. PLUM CURCULIO.

Conotrachelus nenuphar Herbst.

REMEDY: } See No. 31.
CHIEF ARTICLES: }

INSECTS AFFECTING THE ORANGE.

(*Citrus.*)

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1880, pp. 202–208; Comstock and Howard, Rept. Dept. Agric., 1880, pp. 276–333; Hubbard, Rept. Dept. Agric., 1881, pp. 106–127; Orange Insects.

56. RUST MITE.

Phytopus oleivorus Ashm.

REMEDIES: Alkaline washes; sulphur; kerosene emulsion.

CHIEF ARTICLES: Hubbard, Orange Insects, p. 107; Rept. Dept. Agric., 1884, p. 36.

57. SIX-SPOTTED MITE.

Tetranychus 6-maculatus Riley.

REMEDIES: See No. 56.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1889, p. 340.

58. TWO-STRIPED WALKING-STICK.

Anisomorpha buprestoides Stoll.

59. LUBBER GRASSHOPPER.

Dictyophorus reticulatus Thunb.

REMEDY: Hand-picking.

CHIEF ARTICLES: Glover, Rept. Dept. Agric., 1872, p. 116; Shufeldt, Science, 1883.

60. ANGULAR-WINGED KATYDID.

Microcentrum retinervis Burm.

REMEDY: Collection of the eggs during winter.

CHIEF ARTICLES: Riley, 6th Rept. Ins., Mo., pp. 155–164; Comstock, Rept. Dept. Agric., 1880, pp. 249–251.

61. MOLE CRICKET.

Gryllotalpa borealis Burm.

62. COTTON STAINER.

Dysdercus suturellus H.-Schf.

REMEDY: Kerosene emulsion.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1879, pp. 203–205; Hubbard, Bull. No. 1, Dept. Agric., pp. 14–16; Riley and Howard, "Insect Life," vol. I, p. 234.

63. LEAF-FOOTED PLANT-BUG.

Leptoglossus phyllopus Linn.

64. EUTHOCTHA GALEATOR Fab.

65. NEZARA HILARIS Say.

66. EUSCHISTUS FISSILIS Uhl.

67. ARÆOCERUS FASCICULATUS DeG.

68. HYPOTHENEMUS ERUDITUS Westw.

69. PACHNÆUS DISTANS Horn.

70. FULLER'S ROSE-BEETLE,

Aramigus fulleri Horn.

REMEDIES: Hand-picking; jarring as with No. 9.

CHIEF ARTICLES: Riley, Rept. Dept. Agric., 1878, pp. 255–257.

71. ORANGE LEAF-NOTCHER.

Artipus floridanus Horn.

REMEDIES: Jarring as with No. 9.

72. EPITRAGUS TOMENTOSUS Lec.

73. LEPTOSTYLUS BIUSTUS Lec.

74. ORANGE SAWYER.

Elaphidion inerme Newm.

75. CHRYSOBOTHRIS CHRYSŒLA Ill.

76. ORANGE LEAF-ROLLER.

Platynota rostrana Walk.

REMEDIES: Hellebore: Paris green; hand-picking.

77. HOG CATERPILLAR: ORANGE DOG.

Papilio cresphontes Fab.

REMEDIES: Hand-picking of the eggs and larvæ.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1880, pp. 246–248.

Scale Insects.

78. Long-Threaded Mealy-Bug.

Dactylopius longifilis Comst.

REMEDIES: Same as for No. 7.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1880, pp. 276–349.

79. Destructive Mealy-Bug.

Dactylopius destructor Comst.

REMEDIES: Same as for No. 7.

80. Round Scale.

Lecanium hemisphæricum Targ.

REMEDIES: Same as for No. 7.

81. Black Scale.

Lecanium oleæ Bernard.

REMEDIES: Same as for No. 7.

CHIEF ARTICLES, Add'l: Coquillett, Bull. 26, Div. Ent., Dept. Agric.

82. Flat Scale.

Lecanium hesperidum Linn.

83. Barnacle Scale.

Ceroplastes cirripediformis Comst.

REMEDIES: Same as for No. 7.

84. Florida Ceroplastes.

Ceroplastes floridensis Comst.

REMEDIES: Same as for No. 7.

85. Chaff Scale.

Parlatoria pergandii Comst.

REMEDIES: Same as for No. 7.

86. White Scale.

Aspidiotus nerii Bouché.

REMEDIES: Same as for No. 7.

87. Fluted Scale.

Icerya purchasi Mask.

REMEDIES: Same as for No. 7.

CHIEF ARTICLES, Add'l: Riley, Rept. Dept. Agric., 1886, p. 466; 1888, p. 80.

88. Florida Red Scale.

Aspidiotus ficus Riley.

REMEDIES: Same as for No. 7.

89. Purple Scale.

Mytilaspis citricola Pack.

REMEDIES: Same as for No. 7.

90. California Red Scale.

Aspidiotus aurantii Mask.

REMEDIES: Same as for No. 7, and resin wash.

CHIEF ARTICLES, Add'l: Coquillett, Bull. 26, Div. Ent., Dept. Agric.

91. Long Scale.

Mytilaspis gloveri Pack.

REMEDIES: Same as for No. 7.

INSECTS AFFECTING THE STRAWBERRY.

(*Fragaria.*)

GENERAL ARTICLE: Forbes, 13th Rept. Ins. Ill., pp. 60–180.

Injuring the Roots.

92. STRAWBERRY CROWN-BORER.

Tyloderma fragariæ Riley.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 42–44; Forbes, 12th and 13th Repts. Ins. Ill.

93. WHITE GRUB: JUNE BEETLE.

Lachnosterna fusca Fröhl.

REMEDIES: Luring the beetles by lights over tubs into water with skim of kerosene. Against larvæ: Kerosene emulsion.

94. DIPLOTAXIS FRONDICOLA Say.

Injuring the Leaves.

95. STRAWBERRY FALSE WORM.

Harpiphorus maculatus Nort.

REMEDY: Hellebore.

CHIEF ARTICLE: Riley, 9th Rept. Ins. Mo., pp. 27–29.

96. STRAWBERRY SAW-FLY.

Monostegia ignota Nort.

Remedies: Hellebore and arsenicals.

CHIEF ARTICLE: Mally, "Insect Life," vol. II, p. 137.

97. STRAWBERRY LEAF-ROLLER.

Phoxopteris fragariæ Walsh & Riley.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 142–143; Forbes, 13th Rept. Ins. Ill., pp. 87–93.

98. STRAWBERRY ROOT-BORER.

Typophorus canellus Fab.

REMEDIES: Hellebore; air-slacked lime.

CHIEF ARTICLE: Forbes, 13th Rept. Ins. Ill., pp. 159–163.

99. STRAWBERRY ROOT-BORER.

Graphops nebulosus Lec.

REMEDIES: Same as for No. 88.

CHIEF ARTICLE: Forbes, 13th Rept. Ins. Ill., pp. 163–177.

100. CANADIAN OSMIA.

Osmia canadensis Cress.

101. STRAWBERRY WEEVIL.

Anthonomus signatus Say.

REMEDIES: Trap crops; protecting beds with muslin, etc.

CHIEF ARTICLE: Chittenden, "Insect Life," vol V, p. 167.

Injuring the Fruit.

102. DUSKY PLANT-BUG,

Calocoris rapidus Say.

REMEDIES: Kerosene emulsion; pyrethrum.

CHIEF ARTICLE: Forbes, 13th Rept. Ins. Ill., pp. 135–138.

103. TARNISHED PLANT-BUG.

Lygus pratensis L.

REMEDIES: Kerosene emulsion; pyrethrum.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 201–203; Riley, 2d Rept. Ins. Mo., pp. 113–117; Forbes, 13th Rept. Ins. Ill., pp. 115–135.

104. FLEA-LIKE NEGRO-BUG.

Corimelæna pulicaria Germ.

INSECTS AFFECTING THE RASPBERRY.

(*Rubus.*)

Injuring the Roots.

105. RASPBERRY ROOT-BORER.

Bembecia marginata Harr.

REMEDIES: Cutting off and destroying the infested roots.

CHIEF ARTICLE: Riley, 6th Rept. Ins. Mo., pp. 111–113.

Injuring the Canes.

106. SNOWY TREE CRICKET.

Œcanthus niveus DeG.

REMEDIES: Prune and burn infested canes.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 138, 139; 5th do., pp. 120, 121.

107. RASPBERRY CANE BORER.

Oberea bimaculata Oliv.

REMEDIES: Prune and burn infested canes.

108. RED-NECKED CANE-BORER.

Agrilus ruficollis Fab.

REMEDIES: Same as for No. 107.

CHIEF ARTICLE: Walsh & Riley, Amer. Ent., vol. II, p. 103.

Injuring the Leaves.

109. EUTHOCTHA GALEATOR Fabr.

113. CRYPTOCEPHALUS 4-MACULATUS Say.

110. RASPBERRY LEAF-ROLLER.

Exartema permundana Clem.

REMEDY: Collect and burn infested twigs and leaves.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1880, pp. 267–268.

111. RASPBERRY SAW-FLY.

Monophadnus rubi Harr.

REMEDY: Hellebore.

Injuring the Fruit.

112. RASPBERRY SPAN-WORM.

Synchlora glaucaria Gn.

CHIEF ARTICLES: Riley, 1st Mo. Rept., pp. 139–140.

INSECTS AFFECTING THE CURRANT.

(*Ribes.*)

Injuring the Stems.

114. CURRANT STEM-BORER.

Psenocerus supernotatus Say.

REMEDIES: Prune and burn infested stems.

115. CURRANT BORER.

Sesia tipuliformis Linn.

REMEDIES: Same as for No. 114.

Injuring the Leaves.

116. NATIVE CURRANT-WORM.

Pristiphora grossulariæ Walsh.

REMEDY: Hellebore.

CHIEF ARTICLE: Riley, 9th Rept. Ins. Mo., pp. 23–27.

117. IMPORTED CURRANT-WORM.

Nematus ventricosus Klug.

REMEDY: Hellebore.

CHIEF ARTICLE: Riley, 9th Rept. Ins. Mo., pp. 7–22.

INSECTS AFFECTING THE GOOSEBERRY.

(*Ribes.*)

Injuring the Leaves.

118. GOOSEBERRY SPAN-WORM.

Eufitchia ribearia Fitch.

REMEDIES: Arsenical compounds; hand-picking.

CHIEF ARTICLE: Riley, 9th Rept. Ins. Mo., pp. 3–7.

119. ANGERONA CROCATARIA Fab.

120. GRAPTA PROGNE Cram.

121. IMPORTED CURRANT-WORM.

Nematus ventricosus Klug.

REMEDIES:
CHIEF ARTICLE: } See No. 117.

Injuring the Fruit.

122. GOOSEBERRY FRUIT-WORM.

Zophodia grossulariæ Pack.

REMEDIES: Hand-picking; air-slacked lime.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., pp. 140–142.

INSECTS AFFECTING THE MELON.

(*Cucurbitaceæ.*)

Injuring the Stems.

123. SQUASH BUG.

Anasa tristis DeG.

REMEDIES: Pyrethrum; kerosene emulsion.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 194–197.

124. SQUASH BORER.

Melittia ceto Westw.

REMEDIES: Destruction of all vines attacked; crushing eggs with fingers; kerosene emulsion.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., p. 331; Smith, "Insect Life," vol. IV, p. 30; do., vol. V, p. 96; Rept. New Jersey Expr. Station, 1890, p. 476; do., 1891, p. 385.

Injuring the Leaves.

125. CUCUMBER FLEA-BEETLE.

Epitrix cucumeris Harr.

REMEDIES: Dusting with lime after sprinkling with decoction of tobacco stems and soap.

CHIEF ARTICLE: Harris, Ins. Inj. to Veg., pp. 127–128.

126. STRIPED CUCUMBER-BEETLE.

Diabrotica vittata Fab.

REMEDIES: Protecting young plants with netting; Paris green.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 124–126; Gillette, Bull. 5, Iowa Expr. Station, p. 174; Weed, Bull. Ohio Expr. Station, vol. II, No. 6, p. 143; Smith, Rept. N. J. Expr. Station, 1890, p. 480.

127. SQUASH LADYBIRD.

Epilachna borealis Fab.

REMEDIES: Arsenical mixtures; kerosene emulsion.

CHIEF ARTICLES: Fitch, Ann. Reg. of Rural Affairs, 1868, p. 203; Smith, Rept. N. J. Expr. Station, 1890, p. 483.

128. MELON CATERPILLAR.

Eudioptis hyalinata Linn.

REMEDIES: Early planting; hellebore.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1879, pp. 218–220.

Injuring the Fruit.

129. PICKLE WORM.

Eudioptis nitidalis Cram.

REMEDIES: Same as for No. 128.

CHIEF ARTICLES: Riley, 2d Rept. Ins. Mo., pp. 64–70.

INSECTS AFFECTING THE CRANBERRY.

(*Vaccinium.*)

FOR INSECTS AFFECTING CRANBERRIES, see Smith, Bull. 4, Div. Entom., Dept. of Agric.; Special Bull. K and L, and Bull. 90, N. J. Expr. Station, and Rept. N. J. Expr. Station, 1890, p. 487.

Injuring the Leaves.

130. TWO-STRIPED LOCUST.

Caloptenus bivittatus Say.

131. LEATHER COLORED LOCUST.

Acridium alutaceum Harr.

132. COMMON CRICKET.

Gryllus neglectus Scudd.

133. VINE WORM: FIRE WORM.

Rhopobota vacciniana Pack.

REMEDIES: Paris green; proper flooding.

134. GLISTENING CRANBERRY MOTH.

Teras oxycoccana Pack.

REMEDIES: Flooding; Paris green.

CHIEF ARTICLES, Add'l: Riley, 4th Rept. Ins. Mo., pp. 46–47.

135. CRANBERRY SPAN-WORM.

Boarmia pampinaria Guen.

REMEDIES: Same as for No. 133.

136. CHAIN-SPOTTED GEOMETER.

Caterva catenaria Dr.

137. CRANBERRY SCALE.

Aspidiotus ancylus Put.

REMEDIES: Destroying badly infested vines; kerosene emulsion.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1890, p. 292.

138. MICROCENTRUM RETINERVE Burm.

139. CRANBERRY LEAF-HOPPERS.

Athysanus striatus.
Thamnotettix fitchii.
Agallia quadripunctata.

REMEDIES: Hopperdozers.

140. TIP WORM.

Cecidomyia vaccinii Smith.

Injuring the Fruit.

141. CRANBERRY FRUIT-MOTH.

Mineola vaccinii Riley.

REMEDIES: Spraying with Paris green just after the blossoms fall.

INSECTS AFFECTING THE PERSIMMON.

(*Diospyros virginiana.*)

Injuring the Trunk.

142. MINING SCALE.

Chionaspis biclavis Comst.

REMEDY: Kerosene emulsion.

Injuring the Leaves.

143. PERSIMMON PSYLLA.

Trioza diospyrus Ashm.

144. PENTHINA MALACHITANA Zell.

145. REGAL WALNUT MOTH.

Citheronia regalis Fab.

CHIEF ARTICLE: Walsh & Riley, Amer. Ent., vol. I, pp. 230–231.

146. APATELODES TORREFACTA Sm. & Abb.

INSECTS AFFECTING THE GRAPE VINE.

(*Vitis.*)

Injuring the Roots.

147. GRAPE PHYLLOXERA.

Phylloxera vastatrix Planch.

REMEDIES: Submersion; bisulphide of carbon; kerosene emulsion; resin compound.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., pp. 21–24; Riley, 3d Rept. Ins. Mo., pp. 84–96; 4th do., pp. 55–71; 5th do., pp. 57–73; 6th do., pp. 30–87; 7th do., pp. 90–121; 8th do., pp. 157–168; Rept. Dept. Agric., 1884, p. 408; "Insect Life," vol. II, p. 310.

148. BROAD-NECKED PRIONUS.

Prionus laticollis Dr.

REMEDIES: Hot water; bisulphide of carbon; kerosene emulsion.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 124–128; 2d do., pp. 87–88; 5th do., p. 56.

149. TILE-HORNED PRIONUS.

Prionus imbricornis Linn.

REMEDIES: Same as for No. 148.

CHIEF ARTICLES: Riley, 2d Rept. Ins. Mo., pp. 89–91.

150. GRAPE-ROOT BORER.

Sciapteron polistiformis Harr.

REMEDIES: Same as for No. 148.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., pp. 24–27; Riley, 3d Rept. Ins. Mo., pp. 75–77.

Injuring the Trunk and Branches.

151. SNOWY TREE-CRICKET.

Œcanthus niveus DeG.

REMEDIES: Pruning and burning infested twigs.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 138–139; 5th do., pp. 120–121; Murtfeldt, "Insect Life," vol. II, p. 130.

152. ŒCANTHUS LATIPENNIS Riley.

REMEDIES: Same as for No. 151.

CHIEF ARTICLES: Riley, Bull. No. 6, U. S. E. C., Index to Mo. Repts., pp. 60–61; Murtfeldt, "Insect Life," vol. II, p. 130.

153. GRAPE-VINE BARK-LOUSE.

Pulvinaria innumerabilis Rath.

REMEDIES: Same as for No. 7.

CHIEF ARTICLES: J. D. Putnam, Proc. Davenport Ac. Nat. Sc., vol. II, pp. 239–246.

154. GRAPE-CANE GALL-CURCULIO.

Ampeloglypter sesostris Lec.

REMEDY: Destruction of gall-bearing canes.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., pp. 131–132.

155. APPLE TWIG-BORER.

Amphicerus bicaudatus Say.

REMEDY: Destruction of infested branches.

CHIEF ARTICLES: Riley, 4th Rept. Ins. Mo., pp. 51–53; do., p. 54; Popenoe and Marlatt, Rept. Kansas Expr. Station, 1888, p. 45.

156. RED-SHOULDERED TWIG-BORER.

Sinoxylon basilare Say.

REMEDY: Burning infested wood.

CHIEF ARTICLE: Riley, 4th Rept. Ins. Mo., pp. 53–54.

157. GRAPE-VINE FILBERT-GALL.

Lasioptera sp.

CHIEF ARTICLE: Riley, 5th Rept. Ins. Mo. pp. 116–117.

158. GRAPE-VINE APPLE-GALL.

Lasioptera sp.

CHIEF ARTICLE: Riley, 5th Rept. Ins. Mo., pp. 114–116.

159. GRAPE-VINE TOMATO-GALL.

Lasioptera vitis O. S.

CHIEF ARTICLE: Riley, 5th Rept. Ins. Mo., pp. 117–118.

160. WAVED PROCONIA.

Proconia undata Fab.

Injuring the Leaves and Stems.

161. GRAPE-VINE LEAF-HOPPER.

Erythroneura vitis Harr.

REMEDIES: Kerosene emulsion; tarred shield.

CHIEF ARTICLES: Walsh, Prac. Ent. vol. II, pp. 49–52; Townsend, Bull. 5, N. Mex. Expr. Station.

162. GRAPE-VINE APHIS.

Siphonophora viticola Tho.

REMEDIES: Fish-oil soap; kerosene emulsion.

CHIEF ARTICLE: Thomas, 3d Rept. Ins. Ill., p. 55.

163. RED-HEADED FLEA-BEETLE.

Systena frontalis Fab.

CHIEF ARTICLE: Saunders, Ins. Inj. to Fruits, pp. 283–284.

164. GRAPE-VINE FLEA-BEETLE.

Graptodera chalybea Ill.

REMEDIES: Arsenical mixtures; kerosene emulsion.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 79–81; Comstock, Rept. Dept. Agric., 1879, pp. 213–216.

165. GRAPE-VINE COLASPIS.

Colaspis brunnea Fab.

REMEDIES: Jarring; ashes; soot; lime; Paris green.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 81–84; Forbes, 13th Rept. Ins. Ill., p. 156.

166. GRAPE-VINE ADOXUS.

Adoxus vitis Linn.

167. GRAPE-VINE FIDIA.

Fidia longipes Mels.

REMEDY: Jarring.

CHIEF ARTICLES: Walsh, Prac. Ent. vol. II, pp. 87–88; Riley, 1st Rept. Ins. Mo., pp. 132–133.

168. SPOTTED VINE-CHAFER.

Pelidnota punctata Linn.

REMEDY: Hand picking.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 25–26; Riley, 3d Rept. Ins. Mo., pp. 77–79.

169. VARIED ANOMALA.

Anomala varians Burm.

170. ROSE-CHAFER.

Macrodactylus subspinosus Fab.

REMEDIES: Planting Spireas, etc., as trap plants, and collecting beetles in special pans (Smith); arsenicals; kerosene emulsion; hot water.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 35–39; Riley, 5th Rept. Ins. Mo., pp. 108–111; Lintner, 1st Rept. Ins. N. Y., pp. 227–232; Riley, "Insect Life," vol. II, p. 295; Smith, Bull. 82, N. J. Expr. Station.

171. GRAPE-LEAF TRUMPET-GALL.

Lasioptera viticola O. S.

CHIEF ARTICLE: Riley, 5th Rept. Ins. Mo., pp. 118, 119.

172. GRAPE-VINE PLUME.

Oxyptilus periscelidactylus Fitch.

REMEDIES: Hand-picking; Paris green.

CHIEF ARTICLES: Fitch, 1st Rept. Ins. N. Y., pp. 139–143; 3d do., p. 84; Riley, 1st Rept. Ins. Mo., pp. 137, 138; 3d do., pp. 65–68.

173. GRAPE LEAF-FOLDER.

Desmia funeralis Hb.

REMEDY: Hand-picking.

CHIEF ARTICLE: Riley, 3d Rept. Ins. Mo., pp. 61–63.

174. YELLOW-BEAR CATERPILLAR.

Spilosoma virginica Fab.

REMEDIES: Hand-picking; Paris green.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 349–351; Riley, 3d Rept. Ins. Mo., pp. 68–69.

175. AMERICAN PROCRIS.

Procris americana Harr.

REMEDIES: Hand-picking; Paris green.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 336–338; Riley, 2d Rept. Ins. Mo., pp. 85–87.

176. BEAUTIFUL WOOD NYMPH.

Eudryas grata Fab.

REMEDIES: Same as for No. 175.

CHIEF ARTICLES: Riley, 2d Rept. Ins. Mo., p. 83; 6th do., pp. 88–90; Lintner, 26th Ann. Rept. N. Y. Mus. Nat. Hist., pp. 122–124.

177. PEARL WOOD NYMPH.

Eudryas unio Hübn.

REMEDY: Same as for No. 175.

CHIEF ARTICLE: Riley, 2d Rept. Ins. Mo., pp. 83–85; 6th do., pp. 90–94; Lintner, 26th Ann. Rept. N. Y. Mus. Nat. Hist., pp. 122–129.

178. EIGHT-SPOTTED FORESTER.

Alypia octomaculata Fabr.

REMEDIES: Same as for No. 175.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 136, 137; 2d do., pp. 80–82; 6th do., pp. 94–96.

179. GRAPE-VINE HOG-CATERPILLAR.

Ampelophaga myron Cram.

REMEDY: Hand-picking.

CHIEF ARTICLE: Riley, 2d Rept. Ins. Mo., pp. 71–73.

180. WHITE-LINED MORNING SPHINX.

Deilephila lineata Fab.

REMEDY: Hand-picking.

CHIEF ARTICLE: Riley, 3d Rept. Ins. Mo., pp. 140–142.

181. SATELLITE SPHINX.

Philampelus pandorus Hbn.

REMEDY: Hand-picking.

CHIEF ARTICLE: Riley, 2d Rept. Ins. Mo., pp. 76–78.

182. ACHEMON SPHINX.

Philampelus achemon Dr.

REMEDY: Hand-picking.

CHIEF ARTICLE: Riley, 2d Rept. Ins. Mo., pp. 74–76.

183. ABBOT'S SPHINX.

Thyreus abbotii Swains.

REMEDY: Hand-picking.

CHIEF ARTICLE: Riley, 2d Rept. Ins. Mo., pp. 78–79.

184. GRAPE-VINE SAW-FLY.

Blennocampa pygmæa Say.

REMEDY: Hellebore.

CHIEF ARTICLE: Harris, Ins. Inj. to Veg., pp. 522–525.

Injuring the Fruit.

185. GRAPE-SEED WEEVIL.

Craponius inæqualis Say.

REMEDY: Jarring.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., pp. 13–21; Riley, 1st Rept. Ins. Mo., pp. 128–129.

186. INDIAN CETONIA.

Euphoria inda Linn.

CHIEF ARTICLE: Lintner, 1st Rept. Ins. N. Y., pp. 232–239.

187. GRAPE-FRUIT MOTH.

Eudemis botrana Schiff.

REMEDY: Destruction of young worms.

CHIEF ARTICLES: Walsh and Riley, Amer. Ent., vol. I, pp. 177–179; Riley, 1st Rept. Ins. Mo., pp. 133–136.

188. GRAPE-SEED MAGGOT.

Isosoma vitis Saunders.

REMEDY: Destruction of the shriveled fruit.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 129–131; 2d do., pp. 92–94.

189. HONEY BEE.

Apis mellifica Linn.

REMEDY: Bagging. (Does not injure sound fruit.)

CHIEF ARTICLES: McLain, Rept. Dept. Agric., 1885, p. 336; Bull. 13, Div. Entom., p. 70.

INSECTS AFFECTING THE SUGAR CANE.

(*Saccharum officinarum.*)

190. SUGAR CANE BEETLE.

Ligyrus rugiceps Lec.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1879, pp. 246–257; do., 1880, pp. 236–240; Spec. Rept. No. 35, Dept. Agric., 1881, pp. 8–11; Howard, "Insect Life," vol. I, p. 11.

191. SUGAR-CANE BORER.

Diatræa saccharalis Fab.

REMEDY: Burning stalks and stubble before February.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1880, pp. 240–242; Spec. Rept. No. 35, Dept. Agric., 1881, pp. 3–8; Howard, "Insect Life," vol. IV, p. 95.

192. SANDWICH ISLANDS SUGAR-CANE BORER.

Sphenophorus obscurus Bois.

CHIEF ARTICLE: Riley and Howard, "Insect Life," vol. I, p. 185.

INSECTS AFFECTING RICE.

(*Oryza sativa.*)

Injuring the Roots.

193. WATER WEEVIL.

Lissorhoptrus simplex Say.

REMEDY: Draining.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1881, pp. 128–129.

194. RICE GRUB.

Chalepus trachypygus Burm.

REMEDY: Flooding; rotation of crops.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1881, pp. 128–129.

Injuring the Stalk.

195. RICE STALK-BORER.

Chilo plejadellus Znk.

REMEDY: Burning stubble.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1881, pp. 133–135.

196. FALL ARMY-WORM.

Laphygma frugiperda S. & A.

REMEDY: Flooding.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 109–116: Amer. Ent., vol II, pp. 363–365.

INSECTS AFFECTING HOPS.

(*Humulus lupulus.*)

Injuring the Roots.

197. HOP GRUB.

Hydræcia immanis Guen.

CHIEF ARTICLE: Smith, Bull. No. 4, Div. of Ent., Dept. Agric. pp. 34–39.

Injuring the Leaves.

198. HOP PLANT-LOUSE.

Phorodon humuli Schr.

REMEDIES: Destroying all wild plum trees in vicinity; spraying others in fall or spring with strong kerosene emulsion; spraying vines with kerosene emulsion or fish oil soap; after hops are picked destroying vines.

CHIEF ARTICLES: Riley, Rept. Dept. Agric., 1888, p. 93; "Insect Life," vol. I, pp. 70–133.

199. HOP SNOUT-MOTH.

Hypena humuli Harr.

CHIEF ARTICLE: Harris, Ins. Inj. to Veg., pp. 477–478; Smith, Bull. No. 4, Dept. Agric., p. 39.

200. COMMA BUTTERFLY.

Grapta comma Harr.

201. SEMICOLON BUTTERFLY.

Grapta interrogationis Fab.

INSECTS AFFECTING INDIAN CORN.

(Zea mays.)

Injuring the Roots.

Hymenoptera.

202. SMALL BROWN ANT.

Lasius brunneus Latr.

[Attends and protects Corn Root-louse.]

Lepidoptera.

203. THE ROOT WEB-WORM.

Crambus zeellus Fern.

[Larvæ feed upon roots.]

REMEDY: Kerosene emulsion.

CHIEF ARTICLE: Forbes, 14th Rept. Ins. Ill., p. 12.

204. CRAMBUS EXSICCATUS Zell.

[Larvæ occasionally attack the roots.]

205. CRAMBUS MUTABILIS Clem.

[Larvæ occasionally attack the roots.]

206. CRAMBUS CALIGINOSELLUS Clem.

[Larvæ occasionally attack the roots.]

207. THE BURROWING WEB-WORM.

Pseudanaphora arcanella Clem.

[Larvæ feed on the roots.]

CHIEF ARTICLE: Forbes, 16th, Rept. Ins. Ill., p. 98.

208. ACROLOPHUS MORTIPENELLUS Grt.

[Larvæ attack the roots.]

209. ANAPHORA POPEANELLA Clem.

[Larvæ occasionally attack the roots. "Insect Life," vol. III, p. 27.]

Coleoptera.

210. THE WHEAT WIREWORM.:

Agriotes mancus Say.

[Larvæ bore into roots or stalk just at surface of ground.]

CHIEF ARTICLE: Comstock & Slingerland, Cornell Univ. Ag. Expt. St. Bull., 33, pp. 251–258.

211. AGRIOTES PUBESCENS Melsh.

[Larvæ feed on the roots.]

212. MELANOTUS COMMUNIS Gyll.

[Larvæ feed on the roots.]

213. MELANOTUS CRIBULOSUS Lec.

[Larvæ feed on the roots.]

214. WHITE GRUBS.

Lachnosterna spp.

REMEDIES: Poison beetles with Paris green; use of lime and salt in the ground for larvæ.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., p. 156; Forbes, 17th Rept. Ins. Ill., p. 30.

215. THE TILE-HORNED PRIONUS.

Prionus imbricornis Fabr.

[Larvæ occasionally breed in the roots.]

216. THE CORN-ROOT WORM.

Diabrotica longicornis Say.

[Larvæ breed in roots.]

PREVENTIVE: Rotation of crops; lime and ashes.

CHIEF ARTICLE: Forbes, 12th Rept. Ins. Ill., p. 10.

217. THE LARGER CORN-ROOT WORM

Diabrotica 12-punctata Oliv.

[Larvæ breed in the roots.]

PREVENTIVE: Rotation of crops; lime and ashes.

CHIEF ARTICLES: Riley, "Insect Life," Vol. IV, p. 104; Garman, "Psyche," February and March, 1891.

218. DIABROTICA SOROR Lec.

[Larvæ breed in roots. "Insect Life," Vol. III, p. 468.]

219. SPHENOPHORUS PERTINAX Oliv.

[Larvæ breed in roots.]

220. THE CLAY-COLORED BILL—BUG.

Sphenophorus ochreus Lec.

[Larvæ breed in roots.]

CHIEF ARTICLES: Forbes, 16th Rept. Ins. Ill., p. 58; Webster, "Insect Life," Vol. II, p. 132.

221. THE SCULPTURED CORN BILL BUG.

Sphenophorus sculptilis Uhler.

[Adults injure sprouting plants.]

REMEDIES: Protect birds; use of Paris green about the base of the plants.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., p. 55; Comstock, Rept. Dept. Agric., 1880, pp. 272–273; Lintner, 1st Rept. Ins. N. Y., pp. 253–263; Forbes, 16th Rept. Ins. Ill., p. 58.

222. SPHENOPHORUS PLACIDUS Say.

[Larvæ breed in roots.]

REMEDY: Same as for No. 21.

CHIEF ARTICLE: Forbes, 16th Rept. Ins. Ill., p. 58.

223. CORN BILL-BUG.

Sphenophorus robustus Horn.

[Larvæ breed in roots.]

REMEDY: Plow up and burn the stubble.

CHIEF ARTICLES: Riley, Rept. Dept. Agric., 1881, pp. 138–142; Forbes, 16th Rept. Ins. Ill., p. 58.

224. SPHENOPHORUS CARIOSUS Oliv.

[Larvæ breed in roots.]

225. SPHENOPHORUS PARVULUS Syll.

[Adults injure sprouting corn.]

Hemiptera.

226. CHAITOPHORUS FLAVUS Forbes.

[Lives on roots and leaves.]

CHIEF ARTICLE: Forbes, 13th Rept. Ins. Ill., p. 42.

227. CORN APHIS.

Aphis maidis Fitch.

[Lives on roots and leaves.]

REMEDY: Kerosene emulsion.

CHIEF ARTICLES: Forbes, 13th Rept. Ins. Ill., p. 46; Garman, 14th Rept. Ins. Ill., p. 23.

228. CORN-ROOT LOUSE.

Aphis maidis-radicis Forbes.

[Lives on roots and leaves.]

REMEDY: Fall plowing; clean culture early in the spring.
CHIEF ARTICLE: Forbes, 17th Rept. Ins. Ill., p. 64.

Injuring the Leaves.

Hymenoptera.

229. SOLENOPSIS MOLESTA Say.

[Gnaws leaves of young plants.]

Lepidoptera.

230. IMPORTED GYPSY MOTH.

Ocneria dispar L.

[Larvæ feed on leaves.]

231. THE ARGE TIGER MOTH.

Arctia arge Dru.

[Larvæ occasionally feed on leaves.]

232. THE SALT-MARSH MOTH.

Leuarctia acraea Dru.

[Larvæ feed on leaves.]

233. THE YELLOW BEAR.

Spilosoma virginica Fabr.

[Larvæ feed on leaves.]

234. THE SADDLE-BACK CATERPILLAR.

Empretia stimulea Clem.

[Larvæ exceptionally feed on leaves.]

235. THE IO MOTH.

Hyperchiria io Fabr.

[Larvæ occasionally feed on leaves.]

236. THE SMEARED DAGGER.

Acronycta oblinita Sm. & Abb.

[Larvæ feed on leaves.]

237. THE SPOTTED CUTWORM.

Noctua c-nigrum Linn.

[Larvæ cut off young plants.]

REMEDY: Poisoned bait for all cutworms.

238. THE DINGY CUTWORM.

Feltia subgothica Haw.

[Larvæ cut off young plants.]

239. THE WESTERN STRIPED CUTWORM.

Feltia herilis Gr.

[Larvæ cut off young plants.]

240. THE CLAY-BACKED CUTWORM.

Feltia gladiaria Morr.

[Larvæ cut off young plants.]

241. THE DINGY CUTWORM.

Feltia jaculifera Gn.

[Larvæ cut off young plants.]

242. THE W-MARKED CUTWORM.

Noctua clandestina Harr.

[Larvæ cut off young plants.]

243. THE DARK-SIDED CUTWORM.

Carneades messoria Harr.

[Larvæ cut off young plants.]

244. STRIPED OR CORN CUTWORM.

Carneades tessellata Harr.

[Larvæ cut off young plants.]

245. THE BLACK CUTWORM.

Agrotis ypsilon Rott.

[Larvæ cut off young plants.]

246. VARIEGATED CUTWORM.

Peridroma saucia Hbn.

[Larvæ cut off young plants.]

247. THE GLASSY CUTWORM.

Hadena devastatrix Brace.

[Larvæ cut off young plants.]

248. THE YELLOW-HEADED CUTWORM.

Hadena arctica Bdv.

[Larvæ cut off young plants.]

249. HADENA STIPATA Morr.

[Larvæ feed on leaves of young plants.]

250. THE FALL ARMY-WORM.

Laphygma frugiperda S. & A.

[Larvæ feed on leaves and burrow in young plants. Later the leaves and tender ears are damaged.]

REMEDIES: Early fall plowing, ditching and rolling; Paris green.

CHIEF ARTICLES: Forbes, 14th Rept. Ins. Ill., p. 55; Riley, 3d Rept. Ins. Mo., p. 109.

251. THE BRONZE-COLORED CUTWORM.

Nephelodes minians var. *violans* Gn.

[Larvæ cut off young plants.]

252. THE SPINDLE WORM.

Achatodes zeæ Haw.

[Larvæ bore in spindle and thus cut off the leaves.]

253. THE ARMY WORM.

Leucania unipuncta Haw.

[Larvæ feed on leaves.]

REMEDIES: Burning over fields in winter; ditching; Paris green.

CHIEF ARTICLES: Riley, 3d Rept. U. S. Ent. Com., p. 89; 2d Rept. Ins. Mo., pp. 37–56; 8th do., pp. 22–56, 182–185; 9th do., pp. 47–50; Rept. Dept. Agr., 1881, pp. 89–106; Comstock, Rept. Dept. Agr., 1879, pp. 187–191.

254. THE CORN WORM: BOLL WORM.

Heliothis armigera Hbn.

[Larvæ bore in green ears.]

REMEDIES: Late fall plowing; pyrethrum; poisoned sweets.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 104–109; Rept. Dept. Agr., 1881, pp. 145–152; Lintner, 1st Rept. Ins. N. Y., pp. 116–126.

255. THE FODDER WORM.

Epizeuxis æmula Hbn.

[Larvæ feed on leaves of stored fodder-corn.]

256. THE GARDEN WEB-WORM.

Loxostege similalis Gn.

[Larvæ feed on leaves.]

REMEDY: Paris green.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1885, pp. 265–270.

257. THE RED-BANDED LEAF-ROLLER.

Lophoderus triferana Walk.

[Larvæ fold leaves lengthwise and feed within the fold.]

258. THE SULPHUR LEAF-ROLLER.

Dichelia sulphureana Clem.

[Larvæ fold leaves lengthwise and feed within the fold.]

Diptera.

259. THE CORN LEAF-MINER.

Diastata sp.

[Larvæ mine the leaves.]

260. THE CORN-FEEDING SYRPHUS-FLY.

Mesograpta polita Say.

[Larvæ feed upon the leaves.]

REMEDY: Paris green.

CHIEF ARTICLE: Riley and Howard, "Insect Life," vol. I, p. 5.

Coleoptera.

261. THE COMMON LADYBIRD.

Megilla maculata DeG.

[Adults feed occasionally on leaves and soft kernels.]

262. THE ROSE CHAFER.

Macrodactylus subspinosus Fabr.

[Adults feed on leaves.]

CHIEF ARTICLES: Riley, "Insect Life," vol. II, p. 295; Smith, Bull. 82, N. J. Exp. Station.

263. THE BANDED FLEA-BEETLE.

Systena tæniata Say.

[Adults feed on leaves.]

264. THE BRASSY FLEA-BEETLE.

Chætocnema pulicaria Melsh.

[Adults feed on leaves.]

265. CHÆTOCNEMA CONFINIS Cr.

[Adults feed on leaves.]

266. MYOCHROUS DENTICOLLIS Say.

[Adults feed on leaves—MS. Div. Ent. 4092.]

267. PSYLLIODES INTERSTITIALIS Lec.

[Adults feed on leaves—MS. Div. Ent. 4097.]

268. THE STRIPED BLISTER-BEETLE.

Epicauta vittata Fabr.

[Adults feed on leaves.]

269. THE GRAY BLISTER-BEETLE.

Epicauta cinerea Forst.

[Adults feed on leaves.]

270. THE BLACK BLISTER-BEETLE.

Epicauta pennsylvanica DeG.

[Adults feed on leaves.]

271. THE IMBRICATED SNOUT-BEETLE.

Epicærus imbricatus Say.

[Adults feed on leaves.]

Hemiptera.

272. THE CHINCH BUG.

Blissus leucopterus Say.

[Works upon the stalks and leaves.]

REMEDIES: Burning stalks; kerosene emulsion; contagious disease.

CHIEF ARTICLES: Walsh and Riley, Amer. Ent., vol. I, pp. 169-177, 194-199; Riley, 2d Rept. Ins. Mo., pp. 15-37; 7th do., pp. 19-71; Thomas, Bull. No. 5, U. S. Ent. Comm., p. 44; Howard, Rept. Dept. Agric., 1887, pp. 51–88; Forbes, 12th Rept. Ins. Ill., pp. 32–63; 16th do., pp. 1–57.

273. JASSUS INIMICUS Say.

[Works on leaves.]

274. CICADULA NIGRIFRONS Forbes.

[Works on leaves.]

275. CICADULA QUADRILINEATA Forbes.

[Works on leaves.]

276. DELPHAX MAIDIS Ashm.

[Works on leaves.]

Orthoptera.

277. THE WESTERN CRICKET.

Anabrus simplex Hald.

[Feeds on young plants,]

278. THE GLASSY-WINGED GRASSHOPPER.

Orchelimum vulgare Harr.

[Feeds on leaves.]

279. ORCHELIMUM GLABERRIMUM Scudd.

[Feeds on leaves—MS. Div. Ent. 460.]

280. SCUDDERIA PISTILLATA Bruner.

[Feeds on the leaves.]

281. THE RED-LEGGED LOCUST.

Caloptenus femur-rubrum DeG.

[Feeds on the leaves.]

282. THE LESSER MIGRATORY-LOCUST.

Caloptenus atlanis Riley.

[Feeds on the leaves.]

283. THE ROCKY-MOUNTAIN LOCUST.

Caloptenus spretus Thos.

[Feeds on the leaves.]

REMEDIES: Coal tar; kerosene in pans; ditching; burning; rolling; catching; smoking; plowing of eggs.

CHIEF ARTICLES: Walsh, 1st Rept. Ins. Ill., pp. 82–103; Riley, 7th Rept. Ins. Mo., pp. 121–196; 8th do., pp. 57–156; 9th do., pp. 57–124; 1st, 2d, 3d Repts. U. S. Ent. Comm., Washington; Bull No. 25, Div. Ent., Dept. Agric.

284. THE DIFFERENTIAL LOCUST.

Caloptenus differentialis Thos.

[Feeds on the leaves.]

285. THE TWO-LINED LOCUST.

Caloptenus bivittatus Say.

[Feeds on the leaves.]

286. THE AMERICAN LOCUST.

Schistocerca americana Dr.

[Feeds on the leaves.

Arachnida.

287. THE RUST MITE.

Tetranychus sp.

[Causes rusty-brown spots on the leaves.]

Injuring the Stalk.

Lepidoptera.

288. SMALLER CORN STALK-BORER.

Pempelia lignosella Zell.

[Larvæ bore in stalks.]

REMEDY: Plow under or burn stubble.

CHIEF ARTICLE: Riley, Rept. Dept. Agr., 1881, pp. 142–145.

289. THE LARGER CORN STALK-BORER.

Diatræa saccharalis F.

[Larvæ bore in stalks.]

REMEDY: Plow under or burn stubble.

CHIEF ARTICLE: Howard, "Insect Life," IV, p. 95.

290. STALK BORER.

Gortyna nitela Guen.

[Larvæ bore in stalks.]

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 92–93; Lintner, 1st Rept. Ins. N. Y., p. 110.

291. CORN STALK MAGGOT.

Chætopsis œnea Wied.

[Larvæ bore in centre of stalk.]

Orthoptera.

292. ORCHELIMUM VULGARE Harr.

[Deposits eggs in stalks.]

293. SCUDDERIA PISTILLATA Bruner.

[Deposits eggs in stalks.]

Injuring the Kernels or Ears.

Hymenoptera.

294. THE SMALL BLACK ANT.

Monomorium minutum Buck.

[Adults eat into injured kernels.]

295. THE LITTLE BLACK ANT.

Prenolepis nitens Mayer.

Adults eat sprouting kernels.]

296. THE SMALL YELLOW ANT.

Solenopsis fugax Latr.

[Adults eat sprouting kernels.]

Lepidoptera.

297. PLATYNOTA FLAVIDANA Clem.

[Larvæ feed in ears of green corn.]

Diptera.

298. THE SEED-CORN MAGGOT.

Anthomyia zeæ Riley.

[Feeds on sprouted seed corn.]

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 154–156; Lintner, 1st Rept. Ins. N. Y., pp. 199–201.

299. SCIARA sp.

[Feeds in sprouted seed corn.]

Coleoptera.

300. CLIVINA IMPRESSIFRONS Lec.

[Adults feed exceptionally on seed corn.—"Insect Life," Vol. III, p. 159.]

301. OMOPHRON LABIATUM Fabr.

[Larvæ occasionally destroy seed corn.]

302. IPS FASCIATUS Oliv.

[Adults feed exceptionally on kernels of green corn.]

303. CARPOPHILUS ANTIQUUS Melsh.

[Adults feed on injured kernels of green corn.—MS. Div. Ent. 2839.]

304. THE INDIAN EUPHORIA.

Euphoria inda Linn.

[Adults feed on kernels of green corn.]

CHIEF ARTICLE: Lintner, 1st Rept. Ins. N. Y., pp. 232–239.

305. EUPHORIA MELANCHOLICA Gory.

[Adults feed on kernels of green corn.]

306. EUPHORIA SEPULCHRALIS Fabr.

[Adults feed on kernels of green corn.]

307. CENTRINUS PENICELLUS Hbst.

[Adults feed exceptionally on kernels of green corn.—MS. Div. Ent. 2835.]

Hemiptera.

308. CALOCORIS RAPIDUS Say.

[Punctures exposed kernels.]

Myriopoda.

309. IULUS IMPRESSUS Say.

[Occasionally feeds on fallen ears.]

Injuring Stored Corn.

Lepidoptera.

310. THE MEAL SNOUT-MOTH.

Asopia farinalis Linn.

[Breeds in stored grain and corn meal.]

311. THE GRAIN MOTH.

Tinea granella Linn.

[Breeds in stored grain.]

312, 313. MEDITERRANEAN FLOUR MOTH.

Ephestia kuehniella Zell.

[Breeds in meal.]

CHIEF ARTICLE: Riley and Howard, "Insect Life," Vol. II, p. 166.

314. INDIAN MEAL MOTH.

Plodia interpunctella Hbn.

[Breeds in stored corn and corn meal.]

CHIEF ARTICLE: Riley and Howard, "Insect Life," Vol. II, pp. 167–170.

315. THE ANGOUMOIS GRAIN MOTH.

Gelechia cereallella Oliv.

[Breeds in stored corn.]

CHIEF ARTICLE: Riley, Dept. Agric., 1884, pp. 345–350.

Coleoptera.

316. SILVANUS SURINAMENSIS Linn.

[Breeds in stored corn.]

317. SILVANUS CASSIÆ Reich.

[Breeds in stored corn.]

318. SILVANUS ADVENA Waltl.

[Breeds in stored corn.]

319. TYPHŒA FUMATA Linn.

[Larvæ and adults feed on stored corn]

320. TENEBRIOIDES MAURITANICA Linn.

[Larvæ and adults feed upon stored grain to some extent.]

321. SITODREPA PANICEA Linn.

[Breeds in stored corn.]

322. DINODERUS PUNCTATUS Say.

[Adults found in stored corn.—MS. Div. Ent. 3612.]

323. THE AMERICAN MEAL-WORM.

Tenebrio obscurus Fabr.

[Breeds in corn meal.]

324. TRIBOLIUM FERRUGINEUM Fab.

[Breeds in stored corn and meal.]

325. GNATHOCERUS CORNUTUS Fab.

[Breeds in stored corn and meal.]

326. ECHOCERUS MAXILLOSUS Fab.

[Breeds in stored corn and meal.]

327. THE EUROPEAN MEAL WORM.

Tenebrio molitor Linn.

[Breeds in corn meal.]

328. THE RICE WEEVIL.

Calandra oryzæ Linn.

[Breeds in stored grain.]

329. THE GRAIN WEEVIL.

Calandra granaria Linn.

[Breeds in stored grain.]

330. CALANDRA REMOTEPUNCTATA Gyll.

[Breeds in stored grain.]

REMEDY FOR ALL INSECTS INFESTING STORED GRAIN: Bisulphide of carbon in closed bin.

INSECTS AFFECTING COTTON.

(*Gossypium herbaceum.*)

Injuring Stems and Leaves.

Hymenoptera.

331. THE LEAF-CUTTING ANT.

Atta fervens Dru.

Coleoptera.

332. ATAXIA CRYPTA Say.

Injuring the Leaves.

Orthoptera.

333. MONOCREPIDIUS VESPERTINUS Fabr

334. THE AMERICAN LOCUST.

Schistocerca americana Dru.

[Feeds on the leaves.]

335. CALOPTENUS CINEREUS Scudd.

[Feeds on the leaves.]

336. GRYLLUS sp.

[Feeds on the leaves.—"Insect Life," vol. I, p. 87.]

337. GLASSY-WINGED SHARP-SHOOTER.

Homalodisca coagulata Say.

[Punctures leaves.]

REMEDY: Kerosene emulsion.

CHIEF ARTICLE: Riley & Howard, Insect Life, vol. v, pp. 150–154.

Hemiptera.

338. THE COTTON APHIS.

Aphis gossypii Glover.

[Punctures leaves and young bolls.]

Coleoptera.

339. PARIA VIRIDICYANEA Crotch.

[Beetle feeds on the leaves.]

340. ANOMŒA LATICLAVIA Forst.

[Beetle feeds on the leaves.]

Lepidoptera.

341. THE COTTON WORM.

Aletia xylina Say.

[Larvæ feed on the leaves.]

REMEDY: Paris green.

CHIEF ARTICLES: Riley, 4th Rept. U. S. Ent. Comm., p. 344; Comstock, Rept. Cotton Insects, Washington, 1879, p. 511.

342. ANOMIS EXACTA Hbn.

[Larvæ breed on the leaves.]

343. PRODENIA COMMELINÆ S. & A.

[Larvæ feed on the leaves.]

344. PRODENIA FLAVIMEDIA Haw.

[Larvæ feed on the leaves.]

345. THE COMMON YELLOW BEAR.

Spilosoma virginica Fabr.

[Larvæ feed on the leaves.]

REMEDY: Paris green.

CHIEF ARTICLES: Riley, 3d Rept. Insects of Missouri, pp. 68–69.

346. LEUCARCTIA ACRÆA Drury.

[Larvæ feed on the leaves.]

347. THE ROYAL HORNED WALNUT CATERPILLAR.

Citheronia regalis Fab.

[Larvæ feed on the leaves.]

348. THE IMPERIAL MOTH.

Eacles imperialis Dru.

[Larvæ feed on the leaves.]

REMEDY: Paris green.

CHIEF ARTICLE: Harris, Ins. Inj. to Veg., pp. 402–405.

349. THE IO MOTH.

Hyperchiria io Fabr.

REMEDY: Paris green.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 393–396; Riley, 5th Rept. Insects Mo., p. 133.

350. ABBOT'S BAG-WORM.

Oiketicus abbotii Grote.

[Larvæ feed on the leaves.]

351. THE BASKET WORM; BAG-WORM.

Thyridopteryx ephemeræformis Haw.

[Larvæ feed on the leaves.]

REMEDY: Paris green.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., p. 147; Walsh & Riley, Amer. Ent., vol. II, pp. 35–38.

352. THE GARDEN WEB-WORM.

Loxostege similalis Gn.

[Larvæ feed on the leaves.]

REMEDY: Paris green.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1885, pp. 265–270.

353. THE GREAT LEOPARD MOTH.

Ecpantheria scribonia Stoll.

[Larvæ feed on the leaves.]

REMEDY: Paris green.

CHIEF ARTICLE: Riley, 4th Rept. Ins. Mo., p. 141.

354. THECLA PŒAS Hbn.

[Larvæ feed on the leaves.]

355. THE GRANULATED CUT-WORM.

Agrotis annexa Tr.

[Larvæ destroy young plants.]

356. THE SHAGREENED CUT-WORM.

Agrotis malefida Guen.

[Larvæ destroy young plants.]

357. THE FALL ARMY-WORM.

Laphygma frugiperda S. & A.

[Larvæ feed on the leaves.]

REMEDY: Paris green.

CHIEF ARTICLES: Forbes, 14th Rept. Ins. Ill., p. 55; Riley, 3d Rept. Ins. Mo., p. 109.

Injuring the Boll.

Lepidoptera.

358. THE BOLL WORM.

Heliothis armiger Hbn.

[Larvæ bore in the bolls.]

REMEDY: Plant corn as trap crop.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 107–109; Rept. Dept. Agric., 1881, pp. 145–152; 4th Rept. U. S. Ent. Comm., pp. 355–384; Lintner, 1st Rept. Ins. N. Y., pp. 116–126; Mally, Bull. 24, Div. Entom.

359. PLATYNOTA SENTANA Clem.

[Larvæ bore in forms and squares.]

REMEDY: Paris green.

360. THE OBLIQUE-BANDED LEAF-ROLLER.

Cacœcia rosaceana Harr.

REMEDY: Paris green.

361. PRODENIA LINEATELLA Haw.

[Larvæ bore in bolls.]

Hemiptera.

362. THE RED BUG OR COTTON STAINER.

Dysdercus suturellus H. Schf.

[Punctures bolls and seeds, causing them to become abortive; also stains the fiber an indelible red or yellow color.]

REMEDY: Kerosene emulsion.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1879, p. 203; Riley and Howard, "Insect Life," vol I, p. 234.

363. THE LEAF-FOOTED PLANT-BUG.

Leptoglossus phyllopus Linn.

[Punctures buds and young bolls.]

364. CALOCORIS RAPIDUS Say.

[Punctures buds and young bolls.]

365. EUSCHISTUS PUNCTIPES Say.

[Punctures buds and young bolls.]

366. NEZARA PENNSYLVANICA DeG.

[Punctures buds and young bolls.]

Coleoptera.

367. EUPHORIA MELANCHOLICA. G. & P.

[Occasionally feeds on bolls probably otherwise injured.]

INSECTS AFFECTING SMALL GRAINS.

(*Triticum, Hordeum, Avena, etc.*)

368. ROCKY MOUNTAIN LOCUST.

Caloptenus spretus Uhl.

REMEDIES:
CHIEF ARTICLES: } See No. 283.

369. LESSER MIGRATORY LOCUST.

Caloptenus atlanis Riley.

370. RED-LEGGED LOCUST.

Caloptenus femur-rubrum DeG.

371. CALIFORNIA LOCUST.

Camnula atrox Scudd.

372. WESTERN CRICKET.

Anabrus purpurascens Uhl.

REMEDIES: Same as for No. 368.

CHIEF ARTICLES: 2d and 3d Repts. U. S. Ent. Com., Wash., 1880-1883.

373. DESTRUCTIVE LEAF-HOPPER.

Cicadula exitiosa Uhl.

REMEDIES: Torches and trap-lanterns.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1879, pp. 191–193.

374. CHINCH BUG.

Blissus leucopterus Say.

REMEDIES:
CHIEF ARTICLES: } See No. 272.

374a. GRAIN LEAF-HOPPER.

Diedrocephala flaviceps Riley.

375. WHEAT PLANT-LOUSE.

Siphonophora avenæ Fab.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1889, p. 348.

376. NUTTALL'S BLISTER-BEETLE.

Cantharis nuttalli Say.

377. AMERICAN MEROMYZA.

Meromyza americana Fitch.

REMEDIES: Destruction of infested stalks; rotation of crops.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 159–161; Lintner, 1st Rept. Ins. N. Y., pp. 221–227; Forbes, 13th Rept. Ins. Ill., pp. 13–29; Webster, Bull. Ohio Expr. Station, vol. v., No. 4, Second Series; Forbes, 14th Rept. Ins. Ill., p. 54.

378. OSCINIS VARIABILIS Loew.

CHIEF ARTICLE: Garman, Bull. 30, Ky. Expr. Station.

379. CHLOROPS PROXIMA Say.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1879, pp. 257–258.

380. HESSIAN FLY.

Cecidomyia destructor Say.

REMEDIES: Late planting; selection of wheat; rolling and pasturing to sheep.

CHIEF ARTICLES: Packard, Bull. No. 4, U. S. Ent. Com., p. 43; 3d Rept. E. S. Ent. Com., 198; Forbes, 14th Rept. Ins. Ill,, p. 38; do., 15th Rept. Ins. Ill., p. 21.

381. STALK BORER.

Gortyna nitela Guen.

REMEDIES: } See No. 290.
CHIEF ARTICLES: }

382. FALL ARMY-WORM.

Laphygma frugiperda S. & A.

REMEDY: Early plowing.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 109–116; Amer. Ent., vol. II, pp. 363–365; Forbes, 14th Rept. Ins. Ill., p. 55.

383. WHEAT-HEAD ARMY-WORM.

Leucania albilinea Guen.

REMEDIES: Late plowing.

CHIEF ARTICLE: Riley, 9th Rept. Ins. Mo., pp. 50–57.

384. WHEAT FALSE-WORM.

Dolerus arvensis Say.

CHIEF ARTICLE: Riley & Marlatt, "Insect Life," vol. IV, p. 168.

385. WHEAT SAW-FLY.

Nematus marylandicus Nort.

CHIEF ARTICLE: See No. 384.

386. CEPHUS OCCIDENTALIS Marlatt.

CHIEF ARTICLE: See No. 384.

387. BARLEY ISOSOMA.

Isosoma hordei Harr.

REMEDY: Burning stubble.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 551–561; Walsh & Riley, Amer. Ent., vol. I, pp. 149–158; Webster, Bull. Ohio Expr. Station, vol. V., No. 4; Forbes, 14th Rept. Ins. Ill., p. 34.

388. WHEAT ISOSOMA.

Isosoma tritici Riley.

REMEDIES: Same as for No. 382.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1881, pp. 183–187; Webster, Bull. Ohio Expr. Station, 2d Series, vol. v., No. 4; Forbes, 14th Rept. Ins. Ill., p. 36.

Injuring Stored Grains.

[See Nos. 310–330.]

INSECTS AFFECTING GRASS.

(*Gramineæ*)

389. SPHENOPHORUS PARVULUS Gyll.

390. GREEN FIG-EATER; JUNE BEETLE.

Allorhina nitida Linn.

391. WHITE GRUB; MAY BEETLE.

Lachnosterna fusca Fröhl.

REMEDY: } Same as for No. 86.
CHIEF ARTICLES: }

392. THREE-STRIPED CRANE-FLY.

Tipula trivittata Say.

393. LEATHER-JACKET; MEADOW WORM.

Tipula bicornis Loew.

CHIEF ARTICLE: Forbes, 16th Rept. Ins. Ill., p. 78.

394. VAGABOND CRAMBUS.

Crambus vulgivagellus Clem.

REMEDIES: Rolling and burning.

CHIEF ARTICLES: Riley, Rept. Dept. Agric., 1881, pp, 179–183; Lintner, 1st. Rept. Ins. N. Y., pp. 127–149.

395. HOMOPTERA EDUSA Dr.

396. DRASTERIA ERECHTEA Cram.

397. FALL ARMY-WORM.

Laphygma frugiperda S. & A.

REMEDIES: } See No. 250.
CHIEF ARTICLES: }

398. AGROTIS ANNEXA Tr.

399. AGROTIS C-NIGRUM Linn.

400. ARMY WORM.

Leucania unipuncta Haw.

REMEDIES: } See No. 253.
CHIEF ARTICLES: }

401. ARCTIA NAIS Dr.

402. SALT-MARSH CATERPILLAR.

Leucarctia acræa Dr.

REMEDIES: Rolling; submersion.

CHIEF ARTICLE: Harris, Ins. Inj. to Veg., pp. 351–355.

403. ISABELLA TIGER-MOTH.

Pyrrharctia isabella S. & A.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., p. 355; Riley, 4th Rept. Ins. Mo., p. 143.

404. GRAIN MOTH.

Gelechia cerealella Linn.

405. CAROLINA LOCUST.

Œdipoda carolina Linn.

406. LESSER MIGRATORY LOCUST.

Caloptenus atlanis Riley.

407. DIFFERENTIAL LOCUST.

Caloptenus differentialis Uhler.

408. AMERICAN LOCUST.

Schistocerca americana Dr.

INSECTS AFFECTING CLOVER.

(*Trifolium.*)

Injuring the Roots.

409. CLOVER ROOT-BORER.

Hylastes trifolii Müll.

REMEDY: Plowing under in the spring of the second year.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1878, pp. 43–45.

Injuring the Stem.

410. CLOVER STEM-BORER.

Languria mozardi Latr.

REMEDY: Early summer, followed by a fall, cutting.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1879, pp. 199–200; Weed, Bull. Ohio Expr. Station, 2d series vol. III, No. 8, p. 235; Chittenden, "Insect Life," vol. II, p. 346.

Injuring the Leaves.

411. CLOVER MITE.

Bryobia pratensis Gar.

REMEDY: Kerosene emulsion.

CHIEF ARTICLE: Riley & Marlatt, "Insect life," vol. II, p. 45.

412. CLOVER ALEYRODES.

Aleyrodes sp.

413. WHEAT THRIPS.

Limothrips tritici Fitch.

414. CLOVER LEAF-WEEVIL.

Phytonomus punctatus Fab.

REMEDY: Plowing under in May.

CHIEF ARTICLES: Riley, Rept. Dept. Agric., 1881, pp. 171–179; Lintner, 1st. Rept. Ins. N. Y., pp. 247–253; Smith, Rept. N. J. Expr. Station, 1890, p. 519.

415. GRAPEVINE COLASPIS.

Colaspis brunnea Fab.

416. TWELVE-SPOTTED MELON-BEETLE.

Diabrotica 12-punctata Oliv.

REMEDY: } See No. 217.
CHIEF ARTICLES: }

417. CORN ROOT-WORM.

Diabrotica longicornis Say.

REMEDIES: } See No. 216.
CHIEF ARTICLES: }

418. LACHNOSTERNA GIBBOSA Burm.

419. ASH-GRAY BLISTER-BEETLE.

Macrobasis unicolor Kirb.

420. IMBRICATED SNOUT-BEETLE.

Epicærus imbricatus Say.

CHIEF ARTICLE: See No. 9.

421. GRAPHORHINUS VADOSUS Say.

422. SITONES FLAVESCENS Marsh.

CHIEF ARTICLE: Osborn & Gossard, Bull. 14, Iowa Agl. Expt. St., p. 177.

423. PŒCILOCAPSUS LINEATUS Fab.

424. CLOVER-LEAF MIDGE.

Cecidomyia trifolii Loew.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1879, pp. 197–199; Lintner, Ins. of Clover Plant, pp. 11–15.

425. RUSTY-BROWN TORTRIX.

Platynota flavedana Clem.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1880, pp. 257–258.

426. SULPHUR-COLORED TORTRIX.

Dichelia sulfureana Clem.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1880, pp. 255–256.

427. AMPHISA DISCOPUNCTATA Clem.

428. GARDEN WEB-WORM.

Loxostege similalis Gn.

REMEDIES: } See No. 256.
CHIEF ARTICLES: }

429. LOPHODERUS TRIFERANA Walk.

430. ANAPHORA POPEANELLA Clem.

431. GELECHIA ROSEOSUFFUSELLA Clem.

432. PLODIA INTERPUNCTELLA Hübn.

433. BANDED LEAF-ROLLER.

Cacœcia rosaceana Harr.

434. HÆMATOPIS GRATARIA Fab.

435. EUPITHECIA INTERRUPTOFASCIATA Pack.

436. BOARMIA CREPUSCULARIA Tr.

437. ASPILATES DISSIMILARIA Hübn.

438. GREEN CLOVER-WORM.

Hypena scabra Fab.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1879, p. 252.

439. DRASTERIA ERECHTEA Cram.

440. SMALL WHITE BRISTLY CUT-WORM.

Mamestra renigera Steph.

REMEDIES: Baits of clover poisoned with Paris green.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., pp. 86, 87.

441. NEPHELODES MINIANS Gn.

442. ZEBRA CATERPILLAR.

Mamestra picta Harr.

443. CLOVER MAMESTRA.

Mamestra trifolii Esp.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1883, p. 123.

444. BOLL WORM.

Heliothis armiger Hübn.

CHIEF ARTICLES: See No. 254.

445. ARMY WORM.

Lucania unipuncta Haw.

REMEDIES:
CHIEF ARTICLES: } See No. 253.

446. CABBAGE PLUSIA.

Plusia brassicæ Riley.

CHIEF ARTICLE: Rept. Dept. Agric., 1883, p. 119.

447. UNARMED RUSTIC; VARIEGATED CUT-WORM.

Agrotis saucia Tr.

REMEDIES: Same as for No. 246.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., p. 444; Riley, 1st Rept. Ins. Mo., pp. 72–74.

448. PRODENIA COMMELINÆ Sm. & Abb.

CHIEF ARTICLE: Riley, Am. Ent., II, p. 365.

449. SMEARED DAGGER.

Acronycta oblinita S. & A.

REMEDY: Hand-picking.

CHIEF ARTICLE: Riley, 3d Rept. Ins. Mo., pp. 70–72.

450. CROCOTA RUBICUNDARIA Hübn.

451. IO MOTH.

Hyperchiria io S. & A.

452. ARCTIA NAIS Dru.

453. PYRRHARCTIA ISABELLA S. & A.

454. FALL WEB-WORM.

Hyphantria cunea Dru.

REMEDIES:
CHIEF ARTICLES: } See No. 30.

455. NORTHERN CLOUDY-WING.

Eudamus pylades Scud.

456. COMYNTAS BUTTERFLY.

Lycæna comyntas Godt.

457. THE AMERICAN COPPER.

Chrysophanus hypophlæas Bd.

458. MELITÆA EDITHA Bd.

459. YELLOW BUTTERFLY.

Colias philodice Godt.

460. ORANGE SULPHUR.

Colias eurythyme Bd.

461. MEGONOSTOMA CÆSONIA Stoll.

462. CLOUDLESS SULPHUR.

Catopsilia cubule L.

463. BLACK-BORDERED YELLOW.

Terias nicippe Cram.

464. LITTLE SULPHUR.

Terias lisa Bd.

465. RED-LEGGED LOCUST.

Caloptenus femur-rubrum DeG.

466. ROCKY-MOUNTAIN LOCUST.

Caloptenus spretus Thom.

REMEDIES: } See No. 368.
CHIEF ARTICLES: }

467. LESSER MIGRATORY LOCUST.

Caloptenus atlanis Riley.

468. DIFFERENTIAL LOCUST.

Caloptenus differentialis Thom.

469. TWO-STRIPED LOCUST.

Caloptenus bivittatus Say.

Injuring the Flowers and Seeds.

470. CLOVER-SEED MIDGE.

Cecidomyia leguminicola Lint.

CHIEF ARTICLES: Lintner, Rept. N. Y. Agric. Soc., 1878, pp. 62–64; Riley, Rept. Dept. Agric., 1878, pp. 250–252; Comstock, ibid., 1879, pp. 193–196.

471. CLOVER-SEED WORM.

Grapholitha interstinctana Clem.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1880, pp. 254–255; H. A. Gossard, Bull. 19, Iowa Agl. Expr. Station, pp. 571–589.

472. SERICORIS INSTRUTANA Clem.

473. CLOVER-HAY WORM.

Pyralis costalis Fab.

PREVENTIVES: Salting; clean ricks.

CHIEF ARTICLE: Riley, 6th Rept. Ins. Mo., pp. 102–107.

474. THE GRAIN MOTH.

Pyralis farinalis L.

475. PYRALIS OLINALIS Gn.

CHIEF ARTICLE: Same as No. 473.

INSECTS AFFECTING THE BEAN.

(*Phaseolus.*)

476 NUTTALL'S BLISTER-BEETLE.

Cantharis nuttalli Say.

477. AMERICAN BEAN-WEEVIL.

Bruchus obtectus Say.

REMEDIES: Bisulphide of carbon.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 52–56; Popenoe and F. A. Marlatt, Rept. Ks. Expr. Station, 1889, p. 206; Riley & Howard, "Insect Life," vol. IV, p. 297; do., vol. V, p. 27; Lintner, 7th Rept. Ins. N. Y., 1891, pp. 255–279.

478. DISTENDED MAY-BEETLE.

Lachnosterna farcta Lec.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1880, pp. 247, 248.

479. BEAN LEAF-BEETLE.

Cerotoma caminea Fab.

REMEDY: Pyrethrum.

CHIEF ARTICLE: Popenoe and F. A. Marlatt, Rept. Ks. Expr. Station, 1889, p. 262.

480. ROLLER WORM.

Eudamus proteus Linn.

REMEDY: Hand-picking.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1880, pp. 269, 270.

481. BOLL WORM; CORN WORM.

Heliothis armiger Hübn.

REMEDIES:
CHIEF ARTICLES: } See No. 254.

INSECTS AFFECTING THE PEA.

(*Pisum sativum.*)

482. PEA WEEVIL.

Bruchus pisi Linn.

PREVENTIVES: Keeping seed over to second year; bisulphide of carbon in tight vessels.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., pp. 44–50; Riley and Howard, "Insect Life," vol. IV, p. 297.

INSECTS AFFECTING THE CABBAGE AND CAULIFLOWER.

(*Brassica oleracea.*)

483. CABBAGE PLANT-LOUSE.

Aphis brassicæ Linn.

REMEDIES: Kerosene emulsion.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1884, p. 317.

484. HARLEQUIN CABBAGE-BUG.

Murgantia histrionica Hahn.

REMEDY: Pyrethrum.

CHIEF ARTICLES: Riley, 4th Rept. Ins. Mo., pp. 35–38; Lintner, 1st Rept. Ins. N. Y., pp. 264–271.

485. TARNISHED PLANT-BUG.

Lygus pratensis L.

CHIEF ARTICLES: See No. 103.

486. FALSE CHINCH-BUG.

Nysius angustatus Uhl.

REMEDY: Kerosene emulsion.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1884, p. 315.

487. IMBRICATED SNOUT-BEETLE.

Epicærus imbricatus Say.

REMEDIES: } See No. 9.
CHIEF ARTICLES: }

488. COLORADO POTATO-BEETLE.

Doryphora 10-lineata Say.

CHIEF ARTICLES: See No. 534.

489. COLORADO CABBAGE FLEA-BEETLE.

Phyllotreta albionica Lec.

REMEDIES: } See No. 490.
CHIEF ARTICLE: }

490. STRIPED FLEA-BEETLE.

Phyllotreta vittata Fab.

REMEDIES: Kerosene emulsion; pyrethrum.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1884, p. 301.

491. WAVY-STRIPED FLEA-BEETLE.

Phyllotreta sinuata Steph.

REMEDIES: } See No. 490.
CHIEF ARTICLE: }

492. CABBAGE MAGGOT.

Anthomyia brassicæ Bouché.

REMEDIES: Bisulphide of carbon; kerosene emulsion.

CHIEF ARTICLES: Lintner, 1st Rept. Ins. N. Y., pp. 184–191; Riley, Rept. Dept. Agric., 1884, p. 319.

493. CABBAGE OSCINIS.

Oscinis brassicæ Riley.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1884, p. 322.

494. ROCKY MOUNTAIN LOCUST.

Caloptenus spretus Thom.

REMEDIES:
CHIEF ARTICLES: } See No. 283.

495. CABBAGE PLUTELLA.

Plutella cruciferarum Zell.

REMEDIES: Pyrethrum; kerosene emulsion.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1883, pp. 129, 130.

496. CAULIFLOWER BOTIS.

Botis repetitalis Gr.

REMEDIES: Same as for No. 495.

CHIEF ARTICLES: Comstock, Rept. Dept. Agric., 1880, p. 270; Riley, *ibid.*, 1883, pp. 128–129.

497. BOLL WORM.

Heliothis armiger Hübn.

CHIEF ARTICLES, ETC.: See No. 254.

498. CABBAGE PIONEA.

Pionea rimosalis Guen.

REMEDIES: Same as for No. 495.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1883, p. 126.

499. CABBAGE PLUSIA.

Plusia brassicæ Riley.

REMEDIES: Same as for No. 495.

CHIEF ARTICLES: Riley, 2d Rept. Ins. Mo., pp. 110–112; Rept. Dept. Agric., 1880, pp. 119–122; do., 1883, p. 119.

500. GRASS WORM.

Laphygma frugiperda S. & A.

REMEDIES:
CHIEF ARTICLES: } See No. 250.

501. ZEBRA CATERPILLAR.

Mamestra picta Harr.

REMEDIES: Same as for No. 495.

CHIEF ARTICLES: Riley, 2d Rept. Ins. Mo., pp. 112–113; Rept. Dept. Agric., 1883, pp. 124–125.

502. CLOVER MAMESTRA.

Mamestra trifolii Rott.

REMEDIES: Same as for No. 495.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1883, pp. 123–124.

503. SPECKLED CUT-WORM.

Mamestra subjuncta G. & R.

REMEDY: Poisoned bait.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1884, p. 296.

504. GLASSY CUT-WORM.

Hadena devastatrix Brace.

REMEDY: } See No. 503.
CHIEF ARTICLE: }

505. DARK-SIDED CUT-WORM.

Carneades messoria Harr.

REMEDY: } See No. 503.
CHIEF ARTICLE: }

506. VARIEGATED CUT-WORM.

Peridroma saucia Hübn.

REMEDY; } See No. 503.
CHIEF ARTICLE: }

507. W-MARKED CUT-WORM.

Noctua clandestina Harr.

REMEDY: } See No. 503.
CHIEF ARTICLE: }

508. GRANULATED CUT-WORM.

Feltia annexa Tr.

REMEDY: } See No. 503.
CHIEF ARTICLE: }

509. SHAGREENED CUT-WORM.

Feltia malefida Gn.

REMEDY: } See No. 503.
CHIEF ARTICLE: }

510. WESTERN STRIPED CUT-WORM.

Agrotis subgothica Haw.

REMEDY: Same as for No. 503.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., pp. 81–82.

511. BLACK CUT-WORM.

Agrotis ypsilon Root.

REMEDY: } See No. 503.
CHIEF ARTICLE: }

512. SALT-MARSH CATTERPILLAR.

Leucarctia acræa Dr.

REMEDIES: } See No. 402.
CHIEF ARTICLE: }

513. POT-HERB BUTTERFLY.

Pieris oleracea Boisd.

REMEDIES: Same as for No. 495.

CHIEF ARTICLES: Riley, 2d Rept. Ins. Mo., pp. 105–106; Rept. Dept. Agric., 1883, pp. 115–117.

514. LARGE CABBAGE-BUTTERFLY.

Pieris monuste Linn.

REMEDIES: Same as for No. 495.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1883, pp. 117–118.

515. IMPORTED CABBAGE-WORM.

Pieris rapæ Sch.

REMEDIES: Same as for No. 495.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1883, pp. 108–113.

516. SOUTHERN CABBAGE-BUTTERFLY.

Pieris protodice Boisd.

REMEDIES: Same as for No. 495.

CHIEF ARTICLES; Riley, 2d Rept. Ins. Mo., pp. 104–105; Rept. Dept. Agric., 1883, pp. 114–115.

INSECTS AFFECTING THE SWEET POTATO.

(*Ipomœa batatas*)

Injuring the Roots.

517. SWEET-POTATO ROOT-BORER.

Cylas formicarius Fab.

CHIEF ARTICLE: Comstock, Rept. Dept. Agric., 1879, pp. 249–250.

Injuring the Leaves.

518. GOLDEN TORTOISE-BEETLE.

Coptocycla aurichalcea Fab.

REMEDIES: Same as for No. 519.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., p. 62.

519. MOTTLED TORTOISE-BEETLE.

Coptocycla guttata Ol.

REMEDIES: Arsenical mixtures.

CHIEF ARTICLE: Riley, 2d Rept. Ins. Mo., p. 63.

520. TWO-STRIPED TORTOISE-BEETLE.

Cassida bivittata Say.

REMEDIES: Same as for No. 519.

CHIEF ARTICLE: Riley, 2d Rept. Ins. Mo., pp. 61–62.

521. BLACK-LEGGED TORTOISE-BEETLE.

Cassida nigripes Oliv.

REMEDIES: Same as for No. 519.

CHIEF ARTICLE: Riley, 2d Rept. Ins. Mo., pp. 63–64.

522. GREEN TORTOISE-BEETLE.

Physonota unipunctata Say.

523. SWEET-POTATO HAWK-MOTH.

Macrosila cingulata Fab.

REMEDY: Arsenicals.

524. SWEET-POTATO SAW-FLY.

Schizocerus ebenus Nort.

REMEDIES: Arsenicals; hellebore.

CHIEF ARTICLE: Riley and Howard, "Insect Life," vol. I., p. 43.

525. LARGER SWEET-POTATO SAW-FLY.

Schizocerus privatus Nort.

REMEDIES: Arsenicals; hellebore.

CHIEF ARTICLE: Marlatt, "Insect Life," vol. IV., p. 24.

INSECTS AFFECTING THE TOMATO.

(*Lycopersicum esculentum.*)

526. COLORADO POTATO-BEETLE.

Doryphora 10-lineata Say.

REMEDIES:
CHIEF ARTICLES: } See No. 534.

527. BOLL WORM.

Heliothis armiger Hübn.

REMEDIES:
CHIEF ARTICLES: } See No. 254.

528. TOMATO WORM.

Protoparce celeus Say.

REMEDY: Hand picking.

CHIEF ARTICLES: Harris, Ins. Inj. to Veg., pp. 320–321; Riley, 1st Rept. Ins. Mo., pp. 95–96.

529. CABBAGE PLUSIA.

Plusia brassicæ Riley.

REMEDIES:
CHIEF ARTICLES: } See No. 499.

530. STALK BORER.

Gortyna nitela Guen.

REMEDY: Burning of infested stalks.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 92–93; Lintner, 1st Rept. Ins. N. Y., pp. 110–116.

531. SPIDERWORT OWLET-MOTH.

Prodenia commelinæ Gn.

CHIEF ARTICLE: Riley, Am. Ent., vol. III, p. 363.

INSECTS AFFECTING THE POTATO.

(*Solanum tuberosum.*)

Injuring the Stems.

532. RINGED MILLEPEDE.

Cambala annulata Say.

REMEDY: Luring with cut potatoes previously poisoned.

CHIEF ARTICLE: Walsh. Prac. Ent., vol. II, pp. 34–35.

533. POTATO-STALK WEEVIL.

Trichobaris trinotata Say.

REMEDIES: Burning vines when they first wilt.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., pp. 93–95.

Injuring the Leaves.

534. COLORADO POTATO-BEETLE.

Doryphora 10-lineata Say.

REMEDIES: Arsenical mixtures: pyrethrum.

CHIEF ARTICLES: Riley, 1st Rept. Ins. Mo., pp. 101–108; 3d do., pp. 97–101; 4th do., pp. 5–22; 5th do., pp. 52–54; 6th do., pp. 11–16; 7th do., pp. 1–19; 8th do., pp. 1–12; 9th do., pp. 34–37; Potato Pests, N. Y., 1876, p. 108.

535. BOGUS POTATO-BEETLE.

Doryphora juncta Germ.

536. THREE-LINED POTATO-BEETLE.

Lema trilineata Oliv.

CHIEF ARTICLE: Riley, 1st. Rept. Ins. Mo., pp. 99–100.

537. POTATO TORTOISE-BEETLE.

Coptocycla clavata Fab.

538. GOLDEN TORTOISE-BEETLE.

Coptocycla aurichalcea Fab.

CHIEF ARTICLE: Riley, 2d Rept. Ins. Mo., p. 62.

539. CUCUMBER FLEA-BEETLE.

Epitrix cucumeris Harr.

540. ASH-GRAY BLISTER-BEETLE.

Macrobasis unicolor Kb.

REMEDIES: Arsenical mixtures; pyrethrum; driving and burning.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., pp. 97–98.

541. WHITE BLISTER-BEETLE.

Macrobasis albida Say.

542. STRIPED BLISTER-BEETLE.

Epicauta vittata Fab.

REMEDIES: Same as for No. 534.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., pp. 96–97; 1st Rept. U. S. Ent. Com., pp. 293–302.

543. CROW BLISTER-BEETLE.

Epicauta corvina Lec.

544. BLACK BLISTER-BEETLE.

Epicauta pennsylvanica DeG.

REMEDIES: Same as for No. 534.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., p. 98.

545. MARGINED BLISTER-BEETLE.

Epicauta cinerea Forst.

REMEDIES: Same as for No. 534.

CHIEF ARTICLE: Riley, 1st Rept. Ins. Mo., pp. 98–99.

546. TREE HOPPER.

Ceresa bubalus Say.

REMEDY: Burning twigs of trees, etc., containing eggs.

CHIEF ARTICLE: Marlatt, Trans. Ks. Acad. Sc., vol. x, 1885–86, p. 84.

547. TOMATO WORM.

Protoparce celeus Hübn.

REMEDY: } See No. 528.
CHIEF ARTICLES: }

548. STALK BORER.

Gortyna nitela Gn.

549. POTATO-TUBER MOTH.

Lita solanella Boisd.

REMEDIES: Destroying infested potatoes; storing in tight rooms.

CHIEF ARTICLES: Riley and Howard, "Insect Life," vol. IV, p. 239.

INSECTS AFFECTING THE TOBACCO.

(*Nicotiana tabacum.*)

Injuring the Leaves.

550. HELIOTHIS RHEXIA S. & A.

551. TOBACCO WORM.

Protoparce carolina Linn.

REMEDY: Hand picking.

Injuring Manufactured Tobacco.

552. DRUG-STORE BEETLE.

Sitodrepa panicea Linn.

REMEDIES: Heat; steam; bisulphide of carbon.

CHIEF ARTICLE: Lintner, 4th Rept. Ins. N. Y., p. 88.

553. CIGARETTE BEETLE.

Lasioderma serricorne Fab.

REMEDIES: Same as for 552.

INSECTS AFFECTING THE ASPARAGUS.

(*Asparagus officinalis.*)

Injuring the Leaves.

554. ASPARAGUS-BEETLE.

Crioceris asparagi Linn.

REMEDIES: Dusting with lime; arsenical mixtures.

CHIEF ARTICLES: Walsh & Riley, Amer. Ent., vol. I., pp. 114–115; Lintner, 1st Rept. Ins. N. Y., pp. 239–246; Comstock, Rept. Dept. Agric., 1879, pp. 216–218.

555. TWELVE-SPOTTED ASPARAGUS-BEETLE.

Crioceris 12-punctatus L.

REMEDIES: Same as for No. 554.

INSECTS AFFECTING THE ONION.

(*Allium cepa.*)

556. IMBRICATED SNOUT-BEETLE.

Epicærus imbricatus Say.

REMEDY: Hand picking.

CHIEF ARTICLES: Riley, 3d Rept. Ins. Mo., p. 58; Comstock, Rept. Dept. Agric., 1879, p. 249.

557. IMPORTED ONION-FLY.

Anthomyia ceparum Meig.

REMEDIES: Bisulphide of carbon.

CHIEF ARTICLE: Lintner, 1st Rept. Ins. N. Y., p. 172.

558. DARK-SIDED CUT-WORM.

Carneades messoria Harr.

INSECTS INJURIOUS TO THE PARSNIP.

559. PARSNIP WEB-WORM.

Depressaria heracliana DeG.

REMEDIES: Hellebore; arsenicals; burning infested stalks.

CHIEF ARTICLE: Riley, "Insect Life," vol. I, p. 94.

INSECTS INJURIOUS TO STOCK.

560. BUFFALO GNAT.

Simulium pecuarum Riley.

REMEDIES: Smudges; oil; grease, etc.

CHIEF ARTICLE: Riley, Rept. Dept. Agric., 1886, p. 492.

561. TURKEY GNAT.

Simulium meridionale Riley.

REMEDIES:
CHIEF ARTICLE: } Same as No. 560.

562. HORN FLY.

Hæmatobia serrata R.-D.

REMEDIES: Application of greases, etc., to cattle; or lime or plaster to dung.

CHIEF ARTICLES: Riley and Howard, "Insect Life," vol. II, p. 93; Riley, Rept. Dept. Agric., 1889, p. 345.

563. OX BOT.

Hypoderma lineata Vill.

PREVENTIVES AND REMEDIES: Strong smelling fats and oils.

CHIEF ARTICLES: Riley, "Insect Life," vol. II, p. 172; do., IV, p. 302; Curtice, Iowa Comp. Med. & Vet. Arch., vol. XII, p. 265.

564. HORSE BOT

Gastrophilus equi Fab.

565. HORSE THROAT-BOT.

Gastrophilus nasalis L.

566. SHEEP BOT.

Œstrus ovis L.

567. SHEEP TICK.

Melophagus ovinus L.

REMEDIES: Oils or kerosene emulsion.

568. CHRYSOPS ATROPOS O. S.

REMEDIES FOR ALL BITING FLIES: Strong smelling oils.

569. CHRYSOPS FULVASTER O. S.

570. CHRYSOPS HILARIS O. S.

571. CHRYSOPS VITTATUS Wied.

572. TABANUS AMERICANUS Forst.

573. TABANUS ATRATUS L.

574. TABANUS PUNCTIFER O. S.

575. TABANUS EXUL O. S.

576. TABANUS LINEOLA Fab.

577. TABANUS NEGROVITTATUS Macq.

578. TABANUS COSTALIS Wied.

579. TABANUS MEXICANUS L.

580. TABANUS CINCTUS Fab.

581. STOMOXYS CALCITRANS L.

582. SUCKING HORSE-LOUSE.

Hæmatopinus asini L.

REMEDY: Kerosene emulsion.

CHIEF ARTICLE: H. Osborn, Bull. 7, Div. Ent., U. S. Dept. Agric., pp. 1–56.

583. LONG-NOSED OX-LOUSE.

Hæmatopinus vituli L.

REMEDY: } See No. 582.
CHIEF ARTICLE: }

584. SHORT-NOSED OX-LOUSE.

Hæmatopinus eurysternus Nitzch.

REMEDY:
CHIEF ARTICLE: } See No. 582.

585. SHEEP LOUSE.

Trichodectes sphærocephalus Nitzch.

REMEDY:
CHIEF ARTICLE: } See No. 582.

586. CATTLE LOUSE.

Trichodectes scalaris Nitzch.

REMEDY:
CHIEF ARTICLE: } See No. 582.

587. CATTLE TICK.

Ixodes bovis L.

REMEDY:
CHIEF ARTICLE: } See No. 582.

HOUSEHOLD PESTS.

588. LITTLE RED ANT.

Monomorium pharaonis L.

REMEDIES: Destroy nests with bisulphide of carbon; poisoned sweets.

CHIEF ARTICLES: Riley, "Good Housekeeping," May 25, 1889; "Insect Life," vol. II, p. 106.

589. BED BUG.

Acanthia lectularia L.

REMEDIES: Benzine, kerosene, or mixture of corrosive sublimate, alcohol, and turpentine.

CHIEF ARTICLES: Same as No. 588.

590. BLOOD-SUCKING CONE-NOSE.

Conorhinus sanguisuga Lec.

REMEDIES:
CHIEF ARTICLES: } Same as No. 588.

591. AMERICAN COCKROACH.

Periplaneta americana L.

REMEDIES: Pyrethrum or buhach.

CHIEF ARTICLES: Riley, "Good Housekeeping," June 8, 1889; "Insect Life," vol. II, p. 266.

592. ORIENTAL COCKROACH.

Periplaneta orientalis L.

REMEDIES:
CHIEF ARTICLES: } Same as No. 591.

593. GERMAN COCKROACH.

Phyllodromia germanica L.

REMEDIES: } Same as No. 591.
CHIEF ARTICLES: }

594. CARPET BEETLE OR BUFFALO MOTH.

Anthrenus scrophulariæ L.

REMEDIES: Benzine; hot ironing over damp cloth; killing by steam.

CHIEF ARTICLES: Riley, "Good Housekeeping," Apr. 13, 1889; "Insect Life," vol. II, p. 127.

595. ATTAGENUS PICEUS Oliv.

CHIEF ARTICLE: Riley, Amer. Nat., Dec. 1882.

596. LEATHER BEETLE.

Dermestes vulpinus Fab.

REMEDIES: Bisulphide of carbon or burning sulphur in tight compartments.

CHIEF ARTICLES: Riley, Rept. Dept. Agric., 1886, p. 258; Jones, "Insect Life," vol. II, p. 63.

597. HOUSE FLY.

Musca domestica L.

598. SOUTHERN CLOTHES-MOTH.

Tinea biselliella Hum.

REMEDIES: Airing and sunning; benzine, packing in paper bags, etc.

CHIEF ARTICLES: Riley, "Good Housekeeping," Apr. 27, 1889; "Insect Life," vol. II, p. 211.

599. BLACK-BANDED CLOTHES-MOTH.

Tinea tapetzella L.

REMEDIES: } Same as No. 598.
CHIEF ARTICLES: }

600. CASE-MAKING CLOTHES-MOTH.

Tinea pellionella L.

REMEDIES: } Same as No. 598.
CHIEF ARTICLES: }

601. COMMON FLEA.

Pulex irritans L.

602. CLOVER MITE.

Bryobia pratensis Gar.

REMEDIES: Benzine indoors; kerosene emulsion outdoors.

CHIEF ARTICLE: Riley and Marlatt, "Insect Life," vol. III, p. 45.

SPECIAL EXHIBIT OF MODELS OF PLANTS AND INSECTS AFFECTING THEM.

603. INDIAN CORN, OR MAIZE.

Zea mays.

A hill of ripening corn reproduced in wax is exhibited as a center piece about which to group the insects affecting this crop, 129 distinct corn enemies being represented in the accompanying cases of the economic exhibit. The corn plant is chosen and thus fully treated as representing the most typical of the cereal crops of temperate North America. The insect enemies represented in the surrounding cases are treated separately, but arranged according to the nature of the injury they do to the corn plant, namely, as affecting the root, stalk, leaves, or ears. Each insect is shown, as far as possible, in its different stages, together with the injury occasioned by it. Remedies are given and references made to the chief literature. (See Nos. 202–330.)

604. COTTON PLANT.

Gossypium herbaceum.

A hill of ripening cotton reproduced in wax is exhibited as a center piece about which to group the insects affecting this crop, some 36 distinct cotton enemies being represented in the accompanying cases of the economic exhibit. The insect enemies represented in the surrounding cases are treated separately, but arranged according to the part of the plant they injure, namely, stems, leaves, or bolls. (See Nos. 331–367.)

605. COTTON WORM.

Aletia xylina.

Model in wax of a portion of the cotton plant, showing characteristic defoliation of the leaves resulting from the attacks of the young or mature larvæ. (See No. 341.)

606. COTTON BOLL WORM.

Heliothis armiger.

Model in wax of a portion of the cotton plant showing injury occasioned by the larvæ of the boll worm to the leaves, squares, forms, and bolls of cotton. (See No. 358.)

607. GOLDEN ROD.

Solidago sp.

Model in wax of a clump of Golden Rod with a number of the insects which commonly frequent it disposed on the bloom, and an accompanying exhibit showing the wide variety of insect life known to breed on it, and also the insects known to frequent it commonly for the honey and pollen.

608. HOP PLANT-LOUSE.

Phorodon humuli.

Unaffected Hop Plant.

A spray of hops, modeled in wax, representing the plant as it appears in vigorous growing condition, and free from the attacks of its principal enemy, the Hop Plant-Louse, to contrast the stronger foliage and more abundant and larger hops produced by plants from which the hop louse has been eradicated by the use of proper remedies. (See No. 198.)

609. HOP PLANT-LOUSE.

Phorodon humuli.

Affected Hop Plant.

A spray of hops modeled in wax, representing the vine as it appears when attacked by the Hop Plant-Louse, showing the blackening and discoloration of the leaves and the small and inferior hops, which are also discolored and otherwise unsuitable for market.

610. HOP PLANT-LOUSE.

Phorodon humuli.

Winter eggs.

Enlarged model in papier mâché of the winter eggs, which are attached by the sexual female to the terminal twigs of the Plum, in crevices around the buds.

611. HOP PLANT-LOUSE.

Phorodon humuli.

Stem-Mother.

The stout female plant-louse shown in this papier mâché model hatches from the winter egg and is characterized by shorter legs and honey-tubes. It gives birth without the intervention of the male to living young, of which three generations are produced on the plum tree, the last being winged and migrating to the hop.

612. HOP PLANT-LOUSE.

Phorodon humuli.

Winged Migrant.

This model represents the first winged generation, the third produced on the Plum. It instinctively flies to the hop plant and is the progenitor of from five to twelve wingless generations of virgin females, which people the hop plants until autumn and are the sole forms which depredate on the hop. In autumn the last generation produces again winged females, which fly to the plum trees.

612a. HOP PLANT-LOUSE.

Phorodon humuli.

Hop-affecting stage.

This model represents the structure and appearance of the five to twelve wingless generations of virgin females which people the hop

plant until autumn. These are the progeny of the *winged migrant* (see 612), and are the sole forms which injure the hop.

613. HOP PLANT-LOUSE.

Phorodon humuli.

Return Migrant.

This model represents the last generation produced on the hop, the winged migrant form which in September returns again to the plum and gives birth to three or more young, which are the true sexual females, the first perfect sexual females produced in the cycle up to this point.

613a. HOP PLANT-LOUSE.

Phorodon humuli.

Pupa of Return Migrant.

This model represents the pupal stage of the *return migrant.* The striking features are the wing-pads, which with another molt become the ample flight organs seen in the model of the adult.

614. HOP PLANT-LOUSE.

Phorodon humuli.

True sexual female.

This model represents the generation born of the return migrant, which never acquire wings and never leave the plum tree. Maturing in a few days, according to the temperature, they are fertilized by the true winged males which have been subsequently developed on the hops, and have come from the hop fields to the plum. Shortly after fertilization the winter eggs, with which the cycle started, are deposited.

614a. HOP PLANT-LOUSE.

Phorodon humuli.

Young sexual female.

This model represents the newly hatched stage of the only perfectly developed sexual female produced in the life cycle of this insect. For the adult of this stage see Exhibit No. 614.

615. HOP PLANT-LOUSE.

Phorodon humuli.

Winged male.

This model represents the first and only male generation produced in the life cycle of the Hop Plant-louse. This is developed in the autumn and flies from the hop to the plum and fertilizes the true sexual females.

616. HOP PLANT-LOUSE.

Phorodon humuli.

REMEDIES AND PREVENTIVES: The attacks of the Hop Plant-louse may be prevented very satisfactorily by first destroying all the wild plum trees in the neighborhood except a few which may be left for trap plants. These latter should be sprayed with strong kerosene emulsion in September to destroy the return migrant and its progeny, and also the winter eggs, and again in spring to reach the two or three plum generations which may have developed from eggs escaping the fall treatment. Secondly, by destroying the hop plants as soon as the crop is gathered. Thirdly, and perhaps least effectively on account of the difficulties attending the treatment, spraying the hop plants with kerosene emulsion diluted about ten times. Fourthly, spraying the affected hop plants with a dilute decoction of quassia chips.

617. HOP PLANT-LOUSE.

Phorodon humuli.

REMEDY: Kerosene emulsion.

Kerosene	gallons..	2	67 per cent.
Common or whale oil soap	pound..	½	
Water	gallon..	1	33 per cent.

Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force pump and spray nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens upon cooling and should adhere without oiliness to the surface of glass. Used for spraying plum trees in spring and fall, also applied to affected hop plants by means of a force pump and spray nozzle.

618. HOP PLANT-LOUSE.

Phorodon humuli.

REMEDY: Quassia. A decoction of quassia chips, made by steeping them in water, is recommended as a wash for the Hop Louse and gives fairly good satisfaction, but is less serviceable than the kerosene emulsion.

619. CHINCH BUG.

Blissus leucopterus.

The Eggs.

The greatly enlarged papier mâché model represents the form of the egg and the terminal cap. The eggs are three-tenths of an inch long, the top being squarely docked and surmounted by four round tubercles near the center. Color from pale whitish to amber. (See No. 272.)

620. CHINCH BUG.

Blissus leucopterus.

First larval stage.

This stage, represented greatly enlarged in the model, differs from the adult in being more elongate and in having two-jointed tarsi, the

head broader and more rounded and the joints of the body subequal. The prevailing color of the whole body is red.

621. CHINCH BUG.

Blissus leucopterus.

Second larval stage.

After the first moult the form represented in the enlarged model is assumed. The red becomes a bright vermilion and contrasts with the pale band across the middle of the body, while the head and prothorax are dusky and coriaceous. Two broad marks appear on the mesothorax and the second, fourth, and fifth abdominal sutures, and one at the tip of the abdomen.

622. CHINCH BUG.

Blissus leucopterus.

Pupa.

The pupa shown in the greatly enlarged models approaches still more nearly the form of the adult, and is not unlike the last larval stage except in being darker and in the appearance of wing-pads, which extend almost across the pale basal abdominal joints.

623. CHINCH BUG.

Blissus leucopterus.

The imago.

The mature insect, which is represented greatly enlarged in papier mâché, is elongate, blackish, and with numerous hairs, or pubescent. Its length is about three-twentieths of an inch. The outer wings are whitish, with a strong distinctive black spot.

624. FLUTED SCALE.

Icerya purchasi.

Model in wax of a twig of Orange infested with the Fluted Scale, *Icerya purchasi*, copied directly from nature, the actual scales being transferred to the model plant. Illustrates the characteristic appearance of the infested plant. (See No. 87.)

624a. FLUTED SCALE.

Icerya purchasi.

Model of non-infested Orange.

This model in wax contrasts with the similar one (No. 624), representing the characteristic appearance of infested plant.

625. FLUTED SCALE.

Icerya purchasi.

Illustrations from the publications of the Division of Entomology, representing the different stages of the Fluted Scale and its principal enemies.

626. FLUTED SCALE.

Icerya purchasi.

Principal enemy, Australian Lady-Bird. (*Vedalia cardinalis.*)

Enlarged model of the adult of this insect, the introduction of which from Australia has effected what was impossible by any other means, the practical annihilation of the Fluted Scale in California.

627. FLUTED SCALE.

Icerya purchasi.

Principal enemy, Australian Lady-Bird. (*Vedalia cardinalis.*)

Enlarged model showing structure and characteristic appearance of the larva. (See 626.)

628. FLUTED SCALE.

Icerya purchasi.

Principal enemy, Australian Lady-Bird. (*Vedalia cardinalis.*)

Enlarged model showing structure and characteristic appearance of the pupa. (See 626.)

629. FLUTED SCALE.

Icerya purchasi.

Illustrations showing the manner in which the Australian Lady-Bird attacks and destroys the Fluted Scale, adult insect A; greatly enlarged B; natural size C.

630. OYSTER-SHELL BARK-LOUSE.

Mytilaspis pomorum.

Gravid female scale.

Model in wax, greatly enlarged, of the female scale, illustrating its characteristic oyster-shell shape and general structure, as viewed from above. (See No. 7.)

631. OYSTER-SHELL BARK-LOUSE.

Mytilaspis pomorum.

Gravid female scale.

Model in wax of the female scale, greatly enlarged, ventral view, showing disposition of the eggs beneath the scales.

632. OYSTER-SHELL BARK-LOUSE.

Mytilaspis pomorum.

Greatly enlarged wax model of newly-hatched larva.

633. OYSTER-SHELL BARK-LOUSE.

Mytilaspis pomorum.

Model in wax of male, enlarged to same proportion as the female scale, showing the striking gnat-like appearance of the male of this and other scale insects.

633a. OYSTER-SHELL BARK-LOUSE.

Mytilaspis pomorum.

Infested Apple Twig.

This model represents a twig of apple, the older parts of which are thickly infested with the Oyster-shell Scale.

634. POTATO PLANT.

Solanum tuberosum.

A model in wax of a healthy potato plant is shown in this exhibit to contrast with an adjoining model, which illustrates the injury done by the principal potato pest, the Colorado Potato Beetle, *Doryphora decemlineata.*

635. POTATO PLANT..

Solanum tuberosum.

A model of a potato plant is shown, representing the injury arising from the attacks of the principal enemy of the potato, the Colorado Potato Beetle, *Doryphora decemlineata.* The beetles are shown in natural position on the defoliated plant, with the larvæ, and also a number of their principal insect enemies, such as predaceous bugs, robber flies, tiger and ground beetles, which attack and destroy the larvæ and eggs. A complete collection of the principal insect enemies of the potato is shown in the regular economic exhibit. (See No. 584.)

636. TOMATO PLANT.

Lycopersicum esculentum.

The wax model of the tomato plant illustrates the work of the Tomato Worm, *Protoparce celeus.* Wax models of the larvæ are shown in natural positions on the plant. (See No. 528.)

637. CURRANT.

Ribes sp.

The wax model of a currant branch illustrates the work of the Imported Currant Worm, *Nematus ventricosus.* For extended exhibit of the insects affecting the currant see regular economic exhibit. (See No. 117.)

638. PLUM CURCULIO.

Conotrachelus nenuphar.

The work of the Plum Curculio on the fruit of the plum, apple, pear, cherry, and peach is illustrated by special models. For full details as to the work of this insect see exhibits in regular economic series.

639. PLUM CURCULIO.

Conotrachelus nenuphar.

Young apples, showing the effects of puncture by the female Curculio. (See No. 31.)

640. PLUM CURCULIO.

Conotrachelus nenuphar.

Young pears, showing effect of puncture by the female Curculio.

641. PLUM CURCULIO.

Conotrachelus nenuphar.

A twig of cherry with ripening fruit is shown, illustrating the effect of punctures by the female Curculio.

642. PLUM CURCULIO.

Conotrachelus nenuphar.

A branch of peach with ripening fruit is shown, illustrating the effect of punctures by the female curculio.

643. PLUM CURCULIO.

Conotrachelus nenuphar.

Twigs of plum with green and ripening fruit, illustrating the effects of the egg punctures of the female Curculio. (See No. 55.)

644. HESSIAN FLY.

Cecidomyia destructor.

Model in wax representing a healthy, unaffected young wheat plant is exhibited to contrast with the same attacked by the Hessian Fly.

645. HESSIAN FLY.

Cecidomyia destructor.

A model in wax is exhibited, illustrating the effects of the attacks of the Hessian Fly.

646. CLOVER PLANT.

Trifolium pratense.

A model in wax of a bunch of clover in vigorous growth is shown, with some of the injuries to the foliage illustrated and certain of the commoner insects frequenting or affecting it disposed on the flowers and stems. For full exhibit of the principal insect enemies of the clover see regular economic series. (*See* Nos. 409–475.)

647. STRAWBERRY FALSE-WORM.

Tenthredinidæ.

Saw-flies.

A model of the strawberry plant in flower and fruit is shown, illustrating the work of two saw-flies, *Monostegia ignota* and *Harpiphorus maculatus*, the larvæ of which, known as false worms, attack the leaves, filling them with numerous small, irregular holes. (See No. 95 and 96.)

648. ORANGE RUST-MITE.

Phytoptus sp.

Wax models of oranges, showing work of the Orange Rust-Mite. (See No. 56.)

649. GRAPE-VINE TRUMPET-GALL.

Cecidomyia viticola.

Model in wax of the abnormal growths caused by sting of a minute Dipterous insect not infrequently observed on the leaves of the Grape. (See No. 171.)

650. GRAPE-VINE TOMATO-GALL.

Lasioptera vitis.

Model in wax of the abnormal growths on terminal twigs of the grape, caused by the sting of a little gnat. (See No. 159.)

651. GRAPE-VINE PHYLLOXERA-GALL.

Phylloxera vastatrix.

Model in wax of the galls produced by the leaf form of the grape phylloxera, showing their characteristic appearance and disposition on the leaf. (See No. 147.)

652. AMERICAN PROCRIS.

Procris americana.

Twig of grape vine modeled in wax, showing the characteristic appearance and work of the larvæ and their method of feeding in uniform rows on the leaf. (See No. 175.)

653. GRAPE-LEAF FOLDER.

Desmia maculalis.

Sprays of grape modeled in wax, showing the characteristic folding of the leaves and the skeletonizing due to the attacks of the larvæ. (See No. 173.)

654. THE GRAPE-SEED WEEVIL.

Craponius inæqualis.

A bunch of grapes, showing damage to the berries by the larvæ of this insect; also punctures made by the female beetle in oviposition. (See No. 185.)

ANATOMICAL MODELS OF INSECTS.

655. THE SILKWORM.

Sericaria mori.

Enlarged model of the larva, showing its complete anatomy; the muscles, nerves, trachæ, viscera, the silk apparatus in its whole extent, the silk-secreting gland, and the gland discovered by Auzoux which secretes a liquid the use of which is most probably to convert the silky matter into insoluble threads. In one of the prolegs may be seen the muscles which move the claws and sucking discs which enable the animal to walk with its true feet in the air. (After Auzoux.)

656. THE SILKWORM.

Sericaria mori.

Enlarged models of the moth, male and female. In each model is shown the atrophy of the digestive tube and the development of the marvelous organs by which the species is perpetuated. (After Auzoux.)

657. THE HONEY BEE.

Apis mellifica.

Enlarged models, reproducing the insect in six different forms—queen, male, wax-worker, worker, bee with propolis, and bee with pollen. In these are shown the external and internal characters which distinguish each type. Also a model of a comb in the same proportion, in which are seen the cells for honey, for pollen, and for the eggs to produce queens, drones and workers, with eggs, larvæ and pupæ in different stages of development. (After Auzoux.)

658. COCK-CHAFER.

Melolontha vulgaris.

Model of the perfect insect enlarged twelve times, showing the muscles, nerves, tracheæ, and viscera, each model separable into as many pieces as there are organs. More than 600 detailed objects are shown, each indicated by a corresponding number. (After Auzoux.)

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SECTION 2.—SYSTEMATIC AND BIOLOGIC ENTOMOLOGY.

SERIES OF SAMPLE BOXES SHOWING THE ARRANGEMENT OF THE SYSTEMATIC COLLECTION.

659. NORTH AMERICAN COLEOPTERA.

Family Cicindelidæ. Genera: Amblychila, Omus, Tetracha, and Cicindela in part. Thirty-eight species and varieties represented.

660. NORTH AMERICAN COLEOPTERA.

Families Lucanidæ and Scarabæidæ. Genera: Lucanus, Dorcus, Platycerus, Ceruchus, Sinodendron, Passalus, Canthon, Deltochilum, Chœridium, Copris, and Phanæus in part. Thirty-eight species represented.

661. NORTH AMERICAN DIPTERA.

Family Syrphidæ. Genera: Volucella, Copestylum, Sericomyia in part, Arctophila and Eristalis in part. Forty species represented.

662. NORTH AMERICAN HETEROPTERA.

Families: Arthropteridæ, Scutelleridæ, Corymelænidæ, Cydnidæ. Genera: Chlænocoris, Tetyra, Aulacostethus, Pachycoris, Orsilochus, Diolcus, Tiridates, Homæmus, Sphyrocoris, Camirus, Acantholoma, Phimodera, Eurygaster, Augocoris, Corimelæna, Cyrtomenus, Homaloporus, Æthus, Cydnus, Microporus, Pangæus, Melanæthus, Amnestus, Canthophorus. Fifty-three species represented.

663. NORTH AMERICAN HOMOPTERA.

Family, Cicadidæ. Genera: Tettigia, Caryneta, Platypedia, Proarna, Cicada. Eighteen species represented.

664. NORTH AMERICAN HYMENOPTERA.

Family Apidæ. Genus: Bombus in part. Twenty-eight species represented.

665. NORTH AMERICAN NEUROPTERA.

Subfamily, Libellulina. Genera: Pantala, Tramea, Celithemis, Platythemis and Libellula in part. Twelve species represented.

666. NORTH AMERICAN ORTHOPTERA.

Family Acridiidæ. Genus: Trimerotropis. Seventeen species represented.

667. NORTH AMERICAN LEPIDOPTERA.

Family Sphingidæ. Genera: Ællopos, Enyo, Amphion, Thyreus, Deidamia, Deilephila, Chærocampa and Ampelophaga. Twelve species represented.

668. NORTH AMERICAN LEPIDOPTERA.

Families, Choreutidæ, Anaphoridæ, Talæporidæ, and Tineidæ. Genera: Choreutis, Brenthia, Walsinghamia, Setiostoma, Neolophus, Eulepiste, Hypoclopus, Acrolophus, Anaphora, Felderia, Ortholopus, Pseudanaphora, Solenobia, Xylesthia, Euplocamus and Tinea in part. Forty-five species represented.

669. NORTH AMERICAN ARACHNIDA.

Family, Epeiridæ. Genera: Gasteracantha, Acrosoma, Ordgarius, Gea, Argiope, Nephila, and Epeira in part. Eighteen species represented.

670. NORTH AMERICAN MYRIOPODA.

Family Polydesmidæ. Genera: Leptodesmus, Paradesmus, Euryurus, Scytonotus, Chætaspis, and Polydesmus in part. Fifteen species represented.

SERIES SHOWING THE ARRANGEMENT OF THE BIOLOGIC COLLECTION.

671. NORTH AMERICAN COLEOPTERA.

Family, Scolytidæ. Genera: Monarthrum, Pityophthorus, Hypothenemus, Xyleborus, Scolytus, Phlœosinus, Hylesinus and Dendroctonus. Thirteen species represented.

672. NORTH AMERICAN COLEOPTERA.

Family, Cerambycidæ. Genera: Cyllene, Clytus, Neoclytus, Rhagium, Oncideres, Saperda. Ten species represented.

673. NORTH AMERICAN COLEOPTERA.

Families, Lucanidae and Scarabæidæ. Genera: Lucanus, Platycerus, Passalus, Canthon, Copris, and Dynastes. Seven species represented.

674. NORTH AMERICAN DIPTERA,

Families: Trypetidæ and Ortalidæ. Genera: Trypeta, Pyrgota, Anacampta, Euxesta, and Chætopsis. Twenty-three species represented.

675. NORTH AMERICAN HETEROPTERA.

Family: Pentatomidæ. Genera: Stiretron, Perillus, Mutyca, Podisus, Euthyrhynchus, Brochymena, Cosmopepla, Œbalus, Euchistus, Menecles, Lioderma, Thyanta, and Nezara. Twenty-two species represented.

676. NORTH AMERICAN HOMOPTERA.

Family: Cicadidæ; Cicada septendecim L.

677. NORTH AMERICAN HYMENOPTERA.

Family: Cynipidæ. Genus: Amphibolips. Twelve species represented.

678. NORTH AMERICAN ORTHOPTERA.

Family: Acridiidæ. Genera: Chimarocephala, Encoptolophus, Tomonotus, Hadrotettix, Dissosteira, Hippiscus, Dictyophorus. Eight species represented.

679. NORTH AMERICAN LEPIDOPTERA.

Family: Pyralidæ. Genera: Margaronia, Desmia, Phlyctænia, Pyrausta, Evergestis, and Chalcœla. Fourteen species represented.

680. NORTH AMERICAN LEPIDOPTERA.

Family: Sphingidæ. Genera: Philampelus, Thyreus, and Deilephila. Five species represented.

681. NORTH AMERICAN LEPIDOPTERA.

Family: Papilionidæ. Genus: Papilio. Six species represented.

Series showing some of the most striking insect forms of Central and South America.

682. Coleoptera from Venezuela; thirty-five species represented.

683–688. Coleoptera from Brazil; two hundred and sixty-seven species represented.

689. Coleoptera from Central America; thirty species represented.

690–705. Lepidoptera from Brazil; two hundred and eight species represented.

706. Lepidoptera from Honduras; fourteen species represented.

707. Orthoptera from Brazil; thirteen species represented.

708. Hemiptera from Brazil; forty-eight species represented.

709. Homoptera from Brazil; fifteen species represented.

710. INSECTS AFFECTING GOLDEN-ROD.

(*Solidago* spp.)

Lepidoptera.

Family Bombycidæ.

Tolype velleda Stoll.
(Larva feeds on leaves.)

Family Noctuidæ.

Cucullia asteroides Gn.
(Larva feeds on leaves.)
Cucullia intermedia Speyer.
(Larva feeds on leaves.)
Monodes nucicolora Gn.
(Larva feeds on leaves.)
Micrœlia diphtheroides Gn.
(Larva feeds on leaves.)
Hypena scabra Fab.
(Larva feeds on leaves.)

Family Geometridæ.

Synchlora glaucaria Gn.
(Larva feeds on leaves.)

Family Pyraustidæ.

Loxostege obliteralis Walk.
(Larva feeds on leaves.)

Family Pterophoridæ.

Oxyptilus tenuidactylus Fitch.
(Larva bores in stem.)

Alucita kellicotti Fisk.
(Larva bores from a few inches above ground down into roots of *Solidago canadensis*.)

Family Tortricidæ.

Œnectra distincta Wlsm.
(Larva folds leaves and feeds within fold.)
Dichelia sulphureana Clem.
(Larva bores in tip of stem.)

Family Grapholithidæ.

Pædisca dorsisignata Clem.
(Larva breeds in roots.)
Pædisca scudderiana Clem.
(Larva lives in gall on stem.)
Grapholitha olivaceana Riley.
(Larva folds leaves and bores in tip of stem.)

Family Gelechiidæ.

Gelechia gallæ-solidaginis Riley.
(Larva lives in stem gall.)
Gelechia flavocostella Clem.
(Larva is a leaf folder.)

Family Lithocolletidæ.

Tischeria solidaginisella Clem.
(Larva is a leaf miner.)
Lithocolletis solidaginis F. & B.
(Larva is a leaf miner.)

Diptera.

Family Cecidomyiidæ.

Cecidomyia solidaginis Loew.
(Larva lives in gall on stem.)
Cecidomyia carbonifera O. S.
(Larva lives in gall on leaves.)

Family Trypetidæ.

Trypeta solidaginis Fitch.
(Larva lives in gall on stem.)

Coleoptera.

Family Cerambycidæ.

Oberea tripunctata Fab.
(Larva bores in stem.)

Family Chrysomelidæ.

Microrhopala vittata Fab.
(Larva mines the leaves.)
Microrhopala xerene.
(Larva mines the leaves.)

SOME CONSPICUOUS INSECTS FREQUENTING THE GOLDEN ROD.

711. HYMENOPTERA.

Family, Ichneumonidæ. Paniscus geminatus Say.

Family, Braconidæ Chelonus sericeus Say.

Family, Chrysididæ. Chrysis parvula Fabr.

Family, Scoliidæ. Myzine interrupta Say; Myzine sexcincta Fab.

Family, Pompilidæ. Pepsis formosa Say; Priocnemis terminatus Say; Pompilus interruptus Say.

Family, Sphecidæ. Priononyx atrata St. Farg.; Sphex ichneumonea L.; Pelopæus cementarius Dru.; Chlorion cœruleum Dru.; Chalybion cœruleum, L.; Ammophila intercepta St. Farg.; Ammophila gryphus Smith.

Family, Larridæ. Tachytes abdominalis Say.

Family, Bembecidæ. Stizus unicinctus Say; Monedula ventralis Say; Bembex fasciata Fab.

Family, Philanthidæ. Cerceris bicornuta Guer.; Cerceris venator Cress.

Family, Eumenidæ. Eumenes fraternus Say; Odynerus dorsalis Fabr.

Family, Vespidæ. Vespa maculata L.; Vespa germanica Fabr.; Vespa diabolica Sauss.; Vespa carolina Dru.; Polistes metricus Say; Polistes variatus Cr.

Family, Andrenidæ. Colletes thoracica Smith; Sphecodes dichroa Smith; Halictus subquadratus Smith; Halictus flavipes Fabr.; Agapostemon radiator Say; Agapostemon nigricornis Fabr.

Family, Apidæ. Epeolus occidentalis Cr.; Ceratina dupla Say; Megachile pollicaris Say; Bombus pennsylvanicus De Geer; Bombus virginicus Ol.; Bombus ternarius Say; Bombus affinis Cr.

712. LEPIDOPTERA.

Family, Nymphalidæ. Argynnis aphrodite Fabr.; Argynnis cybele Fabr.; Argynnis idalia Dru.; Argynnis myrina Cram.; Argynnis bellona Fabr.; Phyciodes tharos Dru.; Grapta interrogationis Fab.; Vanessa antiopa L.; Pyrameis atalanta L.; Pyrameis huntera Fab.; Pyrameis cardui L.; Junonia cœnia Hbn.

Family, Lycænidæ. Chrysophanus hypophlœas Bd.; Lycæna comyntas Godt.

Family, Papilionidæ. Pieris protodice Bd.; Pieris rapæ L.; Nathalis iole Bd.; Terias lisa Bd.; Terias nicippe Cram.; Colias philodice Gdt.; Papilio turnus L.; Papilio asterias Fabr.

713. DIPTERA, COLEOPTERA, HEMIPTERA.

Diptera.—Family, Syrphidæ. Syrphus ribesii L.; Syrphus leseuri Mac.; Syrphus americanus Wied.; Mesograpta polita Say; Sphœrophoria cylindrica Say; Eristalis tenax L.; Eristalis dimidiatus Wied.; Eristalis saxorum Wied.; Eristalis latifrons, Loew.; Eristalis æneus Scop.; Eristalis hirtus Loew.; Eristalis bastardi Mac.; Eristalis vinetorum Fab.; Eristalis transverses Wied.; Syritta pipiens L.; Helophilus latifrons Loew.; Helophilus similis Mac.; Spilomyia fusca Loew.; Milesia ornata Fab.

Family, Tachinidæ. Belvoisia bifasciata Fab.

Coleoptera—Family, Carabidæ. Lebia grandis Hentz; Lebia atriventris Say; Lebia pulchella Dej.; Lebia viridis Say; Lebia viridipennis Dej.; Lebia ornata Say.

Family, Scarabæidæ. Euphoria inda L.; Euphoria sepulchralis Fab.

Family, Cerambycidæ. Cyllene robiniæ Forst.; Cyllene decorus Ol.

Family, Lampyridæ. Chauliognathus pennsylvanicus Fab.

Family, Chrysomelidæ. Diabrotica 12-punctata Ol.; Adimonia cribrata Lec.; Microrhopala erebus Newm.; Microrhopala excavata Ol.

Family, Meloidæ. Nemognatha cribricollis Lec.; Epicauta pennsylvanica De G.

Family, Mordellidæ. Mordellistena unicolor Lec.

Family, Curculionidæ. Copturus quercus Fab.; Centrinus scutellumalbum Say; Pseudobaris farcta Lec.

Family, Rhipiphoridæ. Rhipiphorus pectinatus Fab.

Hemiptera.—Family, Pentatomidæ. Metapodius femoratus Fab.; Euthoctha galeator Fab.

Family, Lygæidæ. Oncopeltus fasciatus Dall.

Family, Reduviidæ. Prionidus cristatus L.

Family, Phymatidæ. Phymata wolffii Stal.

SECTION 3.—SILK INSECTS.

714. THE CECROPIA SILKWORM.
Attacus cecropia Linn.

715. THE CEANOTHUS SILKWORM.
Attacus ceanothis Behr.

THE YAMA-MAI SILKWORM.
Attacus yama-mai Guen.-Men.

716. THE POLYPHEMUS SILKWORM.
Telea polyphemus Linn.

717. THE PROMETHEA SILKWORM.
Attacus promethea Dru.

THE ANGULIFERA SILKWORM.
Attacus angulifera Walk.

718. THE AILANTHUS SILKWORM.
Samia cynthia Dru.

719. THE COLUMBIA SILKWORM.
Attacus columbia Smith.

719a. THE LUNA SILKWORM.
Actias luna Linn.

720. THE MULBERRY SILKWORM.
Sericaria mori Linn.

721. THE IO SILKWORM.
Hyperchiria io Fab.

721a. THE BAG-WORM.
Thyridopterix ephemeræformis Steph.

SECTION 4.—PROFESSIONAL EXHIBIT.

COLLECTING INSECTS.

The important apparatus for the collection of insects consists of various styles of nets adapted for different methods of collecting. These are for collecting insects during flight or about flowers, comprising butterfly nets; for collecting insects from grass or shrubbery, or even trees, comprising beating nets; and nets for collecting aquatic insects, comprising water and dip nets. Several styles of nets for each of these purposes are illustrated in the collection as follows:

Butterfly Nets.

The essentials of collecting apparatus of this class are a light ring (preferably made so that it will fold into small compass for packing) and a light, detachable handle, great strength of these parts or of the net itself not being required on account of the fact that the net is used chiefly in the air. The net is of cheese cloth or light muslin, and should be made into a more or less pointed bag, having a length of about three times the diameter of the net ring.

722. RILEY BUTTERFLY NET.

Made of two pieces of brass wire, each about 20 inches long, bent half circularly and fastened at one end by a folding hinge, having a check on one side. The other ends are beaten into two square loops, which fit over a square projection on the end of the ferule and are firmly secured by milled screw which fits into the end of the ferule. This allows easy removal and folding into small space for convenient carriage.

723. THE SCHÖNBORN BUTTERFLY NET.

This net is similar to the previous, but differs from it in the mode of attachment of the ring to the ferule. The ferule is double and the inner piece is deeply grooved on either side to receive the prolongation of the wire forming the ring. The outer ferule, which is slid down on the handle while the ring is being put in place, is then pushed up over the inner ferule, firmly clamping the ring in place and forming a very strong and satisfactory attachment.

Sweeping Nets.

A much heavier net is required for this purpose, to support the wear coming from vigorous sweeping back and forth in shrubbery and grass. The ring must be very heavy and provided with some means of protecting the cloth from wear at its point of attachment to the ring, and the cloth or bag itself should be of much heavier material than in the butterfly nets.

724. THE DEYROLLE SWEEPING NET.

The ring of this net is a strong flat piece of brass or steel, hinged on either side to allow folding into small compass and grooved exteriorly, the groove being pierced by numerous small holes, so that the net can be fastened on the inside and the fastening twine will be protected from wear by being sunk in the exterior groove. The net rim has a square tongue which enters the ferule and is fastened in place for use by means of a milled screw.

725. THE KIESENWETTER SWEEPING NET.

The principle of this net is in general the same as that of the Riley Butterfly Net, but the ring is of much heavier wire and the net proper is attached to it by means of numerous small brass rings slipped on the main ring of the net. These rings should not be more than three-fourths of an inch apart, and the bag is sewed to them with strong twine and thus protected from wear and tear.

726. THE FISH-NET RING.

A very satisfactory ring for a beating net is the smallest size of brass folding net ring used for catching minnows. It is made of strong wire and folds in two or three places into small compass and may be used with or without rings, as in the last net described.

Water Nets.

These nets are smaller than those just described and the net proper, which may be either of cloth or wire netting, is much shorter, not much exceeding the diameter of the net ring.

727. THE PACKARD WATER NET.

The net ring in this apparatus is moderately strong and is bent squarely across at the front edge to facilitate the scraping of logs or submerged stones. The net proper is either of coarse grass cloth or wire netting.

728. THE JOCKEY-CAP DIP NET.

This is a small water sieve or scoop and is made of wire netting and tin. It is used to collect any particular specimens of aquatic insects or to scrape submerged stones or timber.

Collecting by Beating.

Apparatus for this work consists of an umbrella, beating cloth or other device, which is held beneath a limb or shrub and the latter jarred by means of a stick or by shaking, thus causing the insects to fall from it upon the collecting surface beneath, where they are captured.

729. THE UMBRELLA.

A common umbrella may be used for this purpose, or one specially constructed with a joint near the middle of the handle to facilitate its being held beneath branches and to allow of its being packed into small compass.

730. THE BEATING-CLOTH.

This is used as a substitute for the umbrella, and consists of a stout cloth, a yard square, with a loop of strong twine sewed in at each corner. Two straight sticks to hold it expanded are placed crosswise and fastened to the loops, by which means the cloth is kept outspread. When not in use it can be folded up into small compass.

731. THE MARX UMBRELLA NET.

This net is made from an old umbrella, and two steel rods attached to an umbrella handle at the top and to a sliding ferule at the bottom, constitute the ring. The net is a shallow bag of cloth. When in use the ferule is slipped up the umbrella handle until it catches behind a lip, forming a circle, and when not in use it is allowed to slide back and resume the shape and size, with the net wound about it, of an ordinary unbrella. It is used in beating, and also serves for sweeping.

732. THE SIEVE.

This is a most useful apparatus, and is employed for collecting insects which are harbored by grass, leaves, or rubbish. The ordinary sieve will answer the purpose, or one specially constructed as in the example exhibited. It is used over a cloth or paper.

733. THE BAG SIEVE.

Two brass or steel rings, one of which is covered with wire gauze, are attached to the top and bottom of a strong cloth bag 12 or 15 inches long. Leaves or rubbish are placed in the bag, which is then shaken over a collecting cloth, as with the ordinary sieve.

734. THE HAVERSACK.

The ordinary willow bag or basket used by anglers will serve the entomologist to transport the various collecting bottles and apparatus which it is necessary to take on excursions. Such a one is exhibited.

Tweezers and Forceps.

A variety of implements for collecting, pinning, mounting, and handling insects is essential to satisfactory work. These include tweezers for collecting small and delicate specimens and transferring them to bottles and vials; and various pinning and transferring forceps and brushes.

735. PINNING FORCEPS FOR LETIDOPTERA.

These are peculiar, in being stronger and in having more or less decidedly kneed handles, to adapt them for the heavier work of transferring and setting the larger Lepidoptera. The knee in the handle allows the forceps to be thrust beneath the insect, and allows the pin to be more securely thrust into the cork.

736. COMMON PINNING FORCEPS.

The form exhibited is the one usually employed by entomologists, and serves for all ordinary operations of pinning. Other styles, practically of the same character, are also shown.

737. COLLECTING TWEEZERS.

For this purpose any light, pliable, fine-pointed forceps are suitable, the points being either straight or curved at the tip, according to individual preference. They are used not only for picking up specimens from the collecting cloth or umbrella, but are indispensable for extracting insects from cracks or holes in timber, their burrows, etc. Of the two or three styles exhibited, the larger can be used for collecting scorpions or ferocious insects which one does not care to take with the hand.

738. THE COLLECTING BRUSH.

A common camel's-hair brush is shown, which, being first slightly moistened, is used for collecting very delicate specimens or in transferring them, to avoid the injury which would certainly result from handling them with tweezers or the fingers.

739. THE COLLECTING PILL BOX.

This is a device for collecting Micro-Lepidoptera used by Lord Walsingham. It consists of an ordinary pill box, the bottom of which has been removed and a piece of glass substituted. This pill box admits of the immediate examination of specimens, so that worthless or common species can be discarded.

Boxes for First Preservation of Living Specimens.

In collecting insects it is frequently necessary to keep the specimens obtained alive for purposes of future study or for breeding, and a

variety of boxes will be required to accommodate the insects or their early stages of different orders. These boxes should be nearly air-tight to prevent drying, and this will not endanger the life of the captures, because insects require very little air.

740–743. SEIDLITZ-POWDER BOXES.

These can be obtained of druggists, or made, by any tinsmith, of various sizes, the corners being carefully rounded to permit of the proper bending of the sides. They can be left in the flat until ready for use, and then bent into shape. Two or three convenient sizes are illustrated. The circular tin box used by watchmakers is also excellent.

744. COLLECTING AND PRESERVING SUBSTANCES.

Under this head the chief agents for collecting and preserving and mounting insects are exhibited—alcohol, chloroform, ether, cyanide of potassium, benzine, gasoline, naphtha, creosote, benzole, Wickersheimer's preserving fluid, Spalding's glue, shellac (solid), shellac (fluid), naphthaline cones, naphthaline crystals, gum camphor, bisulphide of carbon, mercury, carbolic acid.

Collecting Bottles.

These consist of any wide-mouthed bottle, or specimen tubes may be used, and they may be of a variety of sizes, to accommodate the different orders of insects. A number of styles are exhibited. Nearly all the collecting bottles now used are charged with cyanide of potassium, which is put in in the solid form and held in place on the bottom of the vial by pouring in liquid plaster of Paris, which subsequently hardens, or by fastening it down with a paper wad.

745. THE CYANIDE BOTTLE WITH PAPER STRIPS.

This is an ordinary cyanide bottle with plaster of Paris covering the cyanide, but to prevent the insects from grating on each other and also to absorb the moisture the vial above the cyanide is partially filled with strips of bibulous paper.

746. THE CYANIDE BOTTLE WITH PAPER LINING.

The absorption of moisture, which is so injurious to delicate small specimens, is also accomplished by putting a strip of blotting paper around the inner side of the bottle and covering the plaster of Paris with circular pieces of blotting paper just fitting the interior of the bottle.

747. VEST POCKET CYANIDE BOTTLE

This is made of a small test tube, the cyanide being broken up somewhat finely, and held in place by crowding in some soft and bibulous paper.

748. GOOSE-QUILL COLLECTING BOTTLE.

This is made of a small cyanide bottle or test tube, and differs from the foregoing in that a goose quill is introduced through the cork, so that small specimens can be put into the bottle without first taking out the cork. This form of bottle will last for several days, but will need recharging oftener than other styles.

749. LARGE CYANIDE BOTTLE.

Similar to No. 745 or 746, but larger, and employed to kill the larger moths, etc.

750. CHLOROFORM AND ETHER BOTTLES.

These are of especial value in the case of butterflies, moths, and delicate Hymenoptera and Diptera. An ordinary stout bottle, with a camel's hair brush securely inserted in the cork, answers the purpose, or in place of the brush a dropping-needle may be inserted in the cork. Both styles are shown.

Apparatus for Rearing Insects.

A diversity of apparatus for the rearing of insects, indoors more particularly, is used in the work of the Division of Entomology. A considerable series of breeding-cages, jars, etc., is exhibited, showing practically all the important vivaria needful for the securing of insects and their protection during the study of their transformations and habits.

751. LARGE GLASS BREEDING JAR WITH EARTH.

Illustrating method of breeding grass-feeding larvæ in jar with earth, in which the larvæ may enter for pupation or hibernation.

752. FLOWER-POT BREEDING-CAGE.

This is a simple device for the rearing of insects on growing plants, either indoors or out. It consists of an ordinary flower pot, containing the plant which is to furnish food for the insect or which is already effected, and a glass cylinder which fits closely into the top of the pot, the free end being covered with muslin. Subject: Oak gall, from New Mexico.

753. LARGE GLASS BREEDING JAR.

Containing maple leaves, and illustrating the method of breeding Lepidopterous larvæ which enter the soil to pupate. Subject: The Maple Worm, *Dryocampa rubicunda*.

755. THE BREEDING CAGE OR VIVARIUM.

This, as at present improved, consists of three distinct parts—the base, the box proper, and the top or cover. The base is specially con-

structed to facilitate keeping the soil in the bottom of the cage moist without pouring water in from above, which would cause packing. It is of zinc, and so arranged that a pan surrounds the perforated compartment for the earth, thus allowing the water poured into the pan to penetrate the perforations and moisten the earth in the breeding-cage gradually and without the disadvantages alluded to. The box proper or central portion has a swinging door, the other three sides being of glass, or one or more of them may be covered with gauze to give ventilation. The top is covered with wire gauze. This cage admits abundant light and air, and is easily opened for the removal of specimens, the insertion of fresh food, etc.

756. THE MUSLIN-COVERED BREEDING CAGE.

This apparatus is useful in the breeding and study of the habits of insects affecting small grains and forage plants, and is applicable to both indoor and outdoor experimentation. It consists of a strong box for the reception of the earth in which the plants to be studied are propagated, and of a light frame covered with gauze, which at the proper time may be fitted closely over the growing plants to retain the insects that have been introduced or to protect the plants from undesirable species. The one exhibited is of small size, and larger boxes will ordinarily be more convenient, while for field work the box with the growing plant may be embedded in the soil, or the screen alone may be used to cover a portion of naturally growing vegetation.

757. THE ROOT CAGE.

This apparatus was devised for the study of insects affecting the roots of plants, and consists of a zinc frame with two plates of glass in a vertical position, with an arrangement for a zinc sliding cover which fits into grooves, and may be removed to admit of examination of the progress of the root-infesting insects. The cage exhibited is of small size, but in the work of the Entomologist cages of various sizes are used, some being very large to admit of the reception of small shrubs.

758. PENT-HOUSE BREEDING CAGE.

This is exhibited to illustrate a simple method of constructing a cage for the breeding of insects which feed on low plants, or for use in the field on collecting excursions. It is constructed by cutting two flexible twigs and bending them into the shape of two arches, putting one over the other at right angles and pushing the ends well into the ground. Over the pent-house thus formed a piece of gauze is stretched and the cage is complete.

759. THE AERIAL BREEDING CAGE, OR BAG.

A simple device for the outdoor rearing of species which oviposit on trees and large shrubs is shown in this exhibit. It is valuable for

the caging of female Lepidoptera out of doors, in order that they may oviposit on a food-plant, or that the males may be attracted and caught, either for introduction with the females or for the collection. The device consists in inclosing a branch of a tree in netting, care being taken to avoid all creases or folds into which the insect might crawl and be killed by spiders from the outside of the bag.

760–773. BREEDING JARS.

Much of the work of breeding insects can be most satisfactorily accomplished by the use of ordinary candy jars or battery jars, or even tumblers and test tubes of small size for very minute wood-boring or gall-making insects. These may be covered with gauze, or, in the case of nearly dry specimens, such as wood-boring insects, or galls, may be inclosed with glass or cork stoppers, to prevent further evaporation Tubes are also available for breeding delicate specimens, such as root lice, or for inclosing the stems of plants containing internal feeders, or for the reception of delicate pupæ. A large series of jars representing the various styles used is exhibited.

774. INSECT PINS.

In mounting insects for the cabinet expressly made entomological pins are used. There are three principal kinds, the Klaeger, the Carlsbad, and the Vienna pins. The Klaeger and Vienna pins are also made japanned, for use with insects which are liable to verdigris. For very minute Lepidoptera and Diptera, etc., very delicate pins are used, such as the Vienna "Minutien nadeln."

775, 776. THE INSECT PUNCH FOR CUTTING TRIANGLES.

The mounting of insects on points, illustrated in this exhibit, necessitates the cutting of cardboard points of various shapes to accommodate insects of different sizes, and greater accuracy and rapidity may be secured by the use of a special punch similar to those used by conductors. One of these is exhibited, also samples of three sizes of the cut points.

777. PINNING AND MOUNTING INSECTS.

An exhibit is made illustrating the different methods of pinning insects in the different orders, and of mounting or otherwise disposing of insects for the general collection or for storage as duplicates.

Spreading apparatus.

For the proper disposition of butterflies, moths, etc., for the cabinet spreading boards are necessary.

778. SPREADING BOARD FOR LEPIDOPTERA.

The exhibit represents the form of spreading board commonly used. It is made of soft white pine, with a strip of cork beneath, in which to

pin the specimens. A slight slant from the middle upward must be provided for in stretching boards in order to counteract the tendency of the wings, however well dried, to drop after the insect is placed in the cabinet.

779. SPREADING CASE.

This is designed for use where a good deal of work is to be done. Five or six spreading boards are made together, forming a shelf, and a number of these shelves are arranged as slide drawers in a suitable case, which is compact and prevents the specimens from being injured by other insects while they are being dried.

780. DRYING OVEN.

For the inflation of the larvæ of Lepidoptera a tin drying oven, placed over an alcohol lamp, is used. The sides are of glass or mica, so that the larva is constantly in view, and the oven is furnished with suitable sliding or hinged doors and with a brass screen on the lower side to regulate and distribute the heat.

781. MICROSCOPIC SLIDE CASE.

This is made of strong pasteboard and is arranged to hold twenty-six slides, the cover bearing numbers from 1 to 26, opposite which may be written the name of each insect mounted and labeled on the respective slides.

782. BALSAM SLIDE MOUNTS.

An exhibit is made of a number of slides showing the method followed in the work of the entomologist in mounting and labeling specimens.

The preservation of alcoholic specimens.

Very much of the biologic material in entomology will be kept in alcohol or other preservative fluids. There are a number of methods of storing the vials, two of the most satisfactory being illustrated.

783. THE RILEY VIAL-HOLDER.

This consists of a small block of wood, in the upper side of which are fastened two curved clamps of music wire, each forming about two-thirds of a circle, and on the back are set four pointed nails which project about one-fourth of an inch, and serve to hold the block to the cork lining of the case or drawer. The advantages of these holders are the ease with which the block can be removed for study or for rearrangement, and the facility of removing the vial itself from the holder.

784, 785. THE MARX TRAY FOR ALCOHOLIC SPECIMENS.

In this methed the vials are stored in a wooden tray, the top piece of which has a cork center in which holes corresponding to the size of the vials are made with a punch. The trays are labeled on the outer end, and numbers of them may be stored together on shallow shelves, and the whole inclosed in a cabinet. Special vials are used, which flare slightly at the top to prevent their sliding through the holes of the upper part of the tray.

Insect boxes.

For the storage of insects both temporarily and in permanent collections a great variety of boxes are used, and also extensive cabinets or drawers. Two styles used in the work of the Division of Entomology are exhibited.

786. THE FOLDING INSECT BOX.

This box is of white pine, shellacked and varnished, the bottom and top of double crossgrain to prevent warping, and lined inside with a thin white-wood strip projecting above the rim of the outside of the box, so that the lid in closing over this strip forms a very tight-fitting cover and prevents the ingress of museum pests. The bottom is cork-lined and covered with a fine white-glazed paper. The advantages of this box are, that its position on the shelves can be readily changed, and that it is convenient for handling.

787. THE CABINET INSECT-DRAWER.

This drawer is designed for the cabinets used in the Department of Agriculture and the U. S. National Museum for orders of insects which have been pretty well worked over and put into permanent shape. The construction of this drawer is somewhat complicated, as it is designed to protect collections absolutely from museum pests. A prominent feature is that the space between the outer and inner walls of the box, between which the tongue of the cover fits, is charged with some insecticide, such as napthaline, which insures the death of any insect which may succeed in gaining a partial entrance to the drawer. This drawer is employed in the insect displays of this exhibit.

SECTION 5.—INSECTICIDES.

ARSENITES.

These poisons are of the greatest service against mandibulate insects, and on account of their caustic properties are of some use against soft-bodied haustellate insects. Unless used cautiously on most plants they are liable to seriously burn the foliage. They may be used dry, either pure or diluted with 100 to 200 parts of flour or other diluent, but are best mixed in water, one pound to 200 to 250 gallons and applied by spraying. To prevent injury to foliage add lime water, milky but not thick enough to clog the nozzle, at the rate of 2 gallons to 100 gallons of spray. White arsenic should never be used without this precaution. Fruit trees should not be sprayed with arsenites until after the blossoms have fallen, on account of the danger of poisoning bees.

788. WHITE ARSENIC.

Commercial white arsenic	pounds..	1
Lime	do....	2

Boil together in 2 to 5 gallons water for half hour. Dilute with 150 to 250 gallons of water.

789. ARSENIC MASH.

Arsenic	parts..	1
Sugar	do...	1
Bran	do...	6

Thoroughly mix bran and arsenic. Dissolve sugar in water, add it to the bran and arsenic, and mix thoroughly, adding water until the whole mass is saturated. Placed about plants to protect from locusts.

790. ARSENIATE OF SODA.

Not commonly used.

791. LONDON PURPLE.

Same as Paris green.

792. PARIS GREEN.

Used dry, diluted or undiluted. As a spray, use 1 pound to 200 or 250 gallons of water, with addition of limewater as above.

793. PARIS GREEN—Adulterated.

Is often sold by the trade. Can be detected by use of strong ammonia, which completely dissolves *pure* Paris green, leaving *no sediment.*

794. PARIS PURPLE.

Used like Paris green.

OTHER INSECTICIDES.

795. ACETIC ACID.

In dilution to about 10 to 15 per cent of the acid. It is applied as a spray.

796. CARBOLIC ACID.

A solution of 1 part in 100 of water is used against parasites on domestic animals and in their houses. Mixed with soft soap and lime it is applied, in spring, to tree trunks to repel borers. It may also be used in solution or in emulsions, either on the foliage or among roots of plants, but kerosene is preferable.

797. SALICYLIC ACID.

Is applied in powder or solution to soft-bodied insects.

798. SULPHURIC ACID.

A weak solution is sprayed on soft-bodied insects.

799. COTTON-SEED OIL.

Rubbed on domestic animals against parasites.

800. OIL OF TURPENTINE.

Applied on the bark of trees and on live-stock suffering from parasites. Is also emulsified with soapsuds and used as a spray against soft-bodied insects.

801. FISH OIL.

Is used pure or with the addition of a little carbolic acid on domestic animals to repel insect pests. (See also fish-oil soap.)

802. PETROLEUM—Crude.

803. PETROLEUM—Refined.

If broken into a very fine mist, may be sprayed sparingly on dormant trees and shrubs and on very hardy foliage. The various emulsions are much preferable for most purposes.

804. KEROSENE—Whale-Oil Soap Emulsion.

In 1 gallon boiling hot water half pound of whale-oil soap is dissolved. To this is added 2 gallons of kerosene and the whole is churned vigorously with force-pump and spray nozzle until a creamy emulsion results which will adhere without oiliness to glass. In regions in which the water is strongly impregnated with lime or magnesium, rain water or water previously broken with lye should be used.

805. KEROSENE MILK EMULSION.

To one part sour milk add two parts kerosene and churn by a force pump or other agitator. A butter-like emulsion results in from three to five minutes, and is diluted *ad libitum* with water. For fuller particulars see late reports and bulletins of the Entomologist.

806. KEROSENE—Bar-Soap Emulsion.

Same as above, except common bar soap is used in place of whale-oil soap.

807. GASOLINE.

Used on domestic animals against insect pests.

808. BENZINE.

This is used in cabinets or applied to household goods to destroy vermin. Enough is applied to make its odor as strong as possible.

809. TRAIN OIL.

Is used the same as fish oil.

810. CREOSOTE.

Used like carbolic acid.

811. SOAP—Soft.

This is rubbed on the trunks of trees to protect from, or to kill, insects. As a strong suds may also be used as a spray.

812. SOAP—Common Bar.

Used the same as soft soap, and as suds.

813. SOAP—WHALE OIL.

Used the same as soft soap, but better.

814. FISH-OIL SOAP.

Is used in solution against plant lice.

Hirsch's crystal potash lye	pounds..	1
Fish oil	pints..	3
Soft water	gallons..	3

Dissolve the lye in the water, bring to a boil, add the oil, continue the boiling two hours. For use dissolve 1 pound of the soap in 5 to 10 gallons of water and apply as a spray.

815. CARBOLIC SOAP.

Any of the above soaps impregnated with carbolic acid. Used on domestic animals against parasites.

816. RESIN SOAP.

Is used against scale insects and plant lice, but is scarcely equal to kerosene emulsion.

Caustic soda	pounds..	1
Resin	do....	2
Tallow	do....	1

Dissolve the caustic soda in 1½ gallons water. In this dissolve the resin and tallow with moderate heat, adding water to make 22 pints of brown thick soap. For use dilute with 44 gallons water and apply as a spray.

817. RESIN COMPOUND FOR SUBTERRANEAN INSECTS.

This remedy is valuable against Grape phylloxera, Apple Root-louse, and other underground insects, having given excellent results with the first two species named. It is made by combining 5 pounds of caustic soda with 40 pounds of resin and diluting with water to 50 gallons. Dissolve the soda in a small quantity of water by boiling and add the resin. After the whole is dissolved, boiling water is added slowly to make 50 gallons of the compound. For use, dilute to 500 gallons and apply, in the case of the Phylloxera, 5 gallons to each vine, pouring it into a basin excavated about the stock of the plant.

818. RESIN WASHES THE FORMULA FOR RED SCALE.

This insecticide has been employed with great efficiency in California against the very injurious Red Scale. It is made as follows:

Resin	pounds..	18
Caustic soda	do....	5
Fish oil	pints..	2½
Water, to make	gallons..	100

The three first named ingredients are placed in cold water and brought to a boil, the temperature being maintained for about an hour and water being added from time to time. The product will assimilate readily with water and should be diluted with the proper quantity of cold water. It should be strained through fine wire sieve or muslin before being sprayed.

819. RESIN WASHES: FORMULA FOR SAN JOSÉ SCALE.

This is a stronger wash and is only applied during the dormant period. It is made in the same manner as the first-named wash, but the boiling is continued twice as long. The ingredients are used in the following proportions:

Resin	pounds..	30
Caustic soda	do....	9
Fish oil	pints..	4½
Water to make	gallons..	100

820. ALCOHOL.

A 30 per cent solution is sprayed on soft-bodied insects. Of but little use.

821. ALUM.

Used either as a powder or in solution.

822. ASHES.

Wood ashes sifted on or placed around the bases of plants.

823. COAL ASHES.

Dusted on plants or placed about their base as a repellant.

824. BICROMATE OF POTASH.

Is dusted on leaf-eating insects.

825. BISULPHIDE OF CARBON.

For use in the ground, a quantity is poured or injected among roots that are being injured. It is similarly used to destroy nests of ants. Against insects injuring stored grain about 1½ pounds are used for each ton of grain in a closed bin. It must be used cautiously, as the fumes mixed with air are very explosive.

826. BORAX.

The powder or a strong solution is applied in crevices or on surfaces frequented by roaches, etc., to drive them away.

827. BORDEAUX MIXTURE.

This important fungicide has some value as an insecticide. It is also better than water as a medium in which to apply Paris green, the lime preventing all injury to foliage.

Copper sulphate	pounds	6
Lime	do	4
Water	gallons	45

Dissolve the copper sulphate in 8 or 10 gallons of water, slack the lime, add water enough to make a creamy whitewash; pour this slowly through a coarse sack into the copper sulphate solution. Add water to make 45 gallons. Add 4 ounces Paris green to each 50 gallons.

828. BRAN.

Often recommended for Cabbage Worm. Probably of little value.

829. CAMPHOR.

As a preventive this is confined in drawers and packages to protect dry goods and specimens.

830. CARBOLIZED LIME.

Finely-pulverized fresh lime, 50 pounds. Crude carbolic acid, 1½ pints. Thoroughly mixed and dusted on plants as a repellant.

831. CARBOLIZED PLASTER.

Same as above, except that common land plaster (gypsum) is used in place of the lime.

832. CHARCOAL.

Powdered charcoal is applied about the base of plants or dusted on the foliage.

833. CHLOROFORM.

Used in closed cases against household pests and insects infesting stored grains; also on domestic animals against certain pests.

834. COAL TAR.

Painted on tree trunks, etc., to catch or prevent insects from mounting. By adding a few quarts to a barrel of water a solution is made to sprinkle plants as a preventive. The smoke from burning coal tar is used as a repellent. Emulsified with soapsuds it is applied as a spray, using one-third coal tar to two-thirds soapsuds, and diluting with 5 to 10 parts of water.

835. CORROSIVE SUBLIMATE.—Mercuric chloride.

Chiefly used in solution against household pests.

836. CYANIDE OF POTASSIUM.

Chiefly used in fumigating fruit trees infested with scale insects. For directions see publications of Division of Entomology.

837. DUST.

Fine dust is effective against various slugs—larvæ of saw-flies.

838. GAS LIME.

Is applied to the soil to prevent injury to plants by root-feeding insects.

839. GAS TAR.

A strong solution is sprayed on plants or applied about the roots. Of but little value.

840. HELLEBORE.

The powder is sifted on alone or mixed 1 part to 20 of flour. With 1 gallon of water one-fourth pound is mixed, as a liquid to be sprayed.

841. LIME.

The dry lime is sifted on, or, as whitewash, is applied with brush.

842. LYE.

In 1 gallon water 1 pound of concentrated lye is dissolved as a solution to spray on trees.

843. MERCURY.

Finely-divided mercury mixed with sand is placed about roots of grape-vines to protect from Phylloxera.

844. NAPHTHALINE.

Used in the ground around roots that are attacked by insects and in cabinets to repel museum pests.

845. NAPHTHA.

Used like kerosene, but not so good.

846. PYRETHRUM FLOWERS—Dalmatian.

From these the Buhach of Mr. G. N. Milco, Stockton, Cal., and the Dalmatian insect powders are made. Species, *P. cinerariæfolium*.

847. PYRETHRUM POWDER OF THE FLOWERS—Dalmatian.

This is the *P. cinerariæfolium*, or California Buhach powder. This is blown or sifted on dry; also applied in water, 1 gallon to a tablespoonful of the powder, well stirred and then sprayed.

848. PYRETHRUM POWDER OF STEMS—Dalmatian.

Used like the preceding, but not so good.

849. PYRETHRUM POWDER—Adulterated.

This is sold quite extensively by the trade, and should be avoided as being poor, often worthless.

850. PYRETHRUM FLOWERS—Persian.

From these the Persian insect powder is derived. Species, *P. roseum*.

851. PYRETHRUM POWDER OF THE FLOWERS—Persian.

P. roseum, or Persian insect powder. Used as just stated above.

852. PYRETHRUM POWDER OF THE STEMS—Persian.

Used like the preceding, but not so good.

853. QUASSIA.

A strong decoction is useful against soft-bodied insects.

854. SALT—Common.

A strong solution is sometimes used as a spray; more often applied in crystal to the ground as a preventive dressing.

855. SALTPETER.

Used the same as salt.

856. SULPHATE OF IRON.

Occasionally used in solution as a spray. A common ingredient of proprietary insecticides. Very injurious to foliage.

857. SULPHATE OF COPPER.

See Bordeaux mixture.

858. SULPHIDE OF POTASSIUM.

Is dissolved in water and used as a spray.

859. SULPHUR POWDER.

Sifted or blown onto plants. The smoke is also used as a fumigant.

860. SULPHOCARBONATE OF POTASSIUM.

Applied in holes or trenches to destroy root-feeding insects like the grape Phylloxera.

861. SULPHUR AND LIME WASH.

Sulphur	pounds..	33
Lime	do....	42
Salt	do....	25
Water to make	gallons..	100

Boil the sulphur and one-half the lime in 33 gallons of water. Mix the salt and remaining one-half the lime and slack the mixture. Add this to the lime-sulphur solution and dilute with water to 100 gallons. Used as spray for scale insects, but not so good as the resin washes.

862. TAR.

Domestic animals are washed in a strong solution to repel insect pests. Also sprayed on plants. Tarred bands, etc., are used to stop progress of chinch bug, army worm, etc.

863. TOBACCO DUST.

Powder made from tobacco stems and waste from cigar factories is dusted on plants and around their base as a repellant.

864. TOBACCO DECOCTION.

This is made as strong as possible as a wash or spray to kill insect pests on animals or plants.

865. WATER.

Cold water if applied with force from a hose will clear plants of many insect pests. Hot water is also effective against many insects.

PATENTED INSECTICIDES.

866. ARSENITE OF AMMONIA.
Fr. Jac. Andres, New York, N. Y.

867. DEATH TO WASPS.
Barclay & Son, London, England.

868. ALLEN'S COCKROACH AND ANT POISON.

869. EUREKA INSECTICIDE.
E. Bean, Jacksonville, Fla.

870. PHOSPHATE SALT.
E. S. Fitch, Bay City, Mich.

871. EGYPTIAN BUG KILLER.
Egyptian Insecticide Company, St. Louis, Mo.

872. TOBACCO SCOTCH SNUFF.
Garrett & Son, Philadelphia, Pa.

873. SULPHUR SOLUTION.
McMaster & Miller, San Mateo, Fla.

874. HOOKER'S COCKROACH AND WATER BUG EXTERMINATOR.
S. A. Hooker, Willimantic, Conn.

875. SWIFT AND SURE INSECTICIDE.
Horticultural and Agricultural Chemical Company, Glasgow, Scotland.

876. SWIFT AND SURE HOP WASH.
Horticultural and Agricultural Chemical Company, Glasgow, Scotland.

877. HAMMOND'S THRIP JUICE.
Benjamin Hammond, Fishkill-on-Hudson, N. Y.

878. HAMMOND'S SLUG SHOT.
Benjamin Hammond, Fishkill-on-Hudson, N. Y.

879. ESSENCE INSECTICIDE.
M. Mohr, Ath. Belgique.

880. HAMMOND'S SCROFULARIÆ.
Benjamin Hammond, Fishkill-on-Hudson, N. Y.

881. X. O. DUST.
Insecticide Manufacturing Company, Baltimore, Md.

882. SWEDISH INSECT POWDER.
J. H. Johnson, Pittsburg, Pa.

883. INSECTICIDE CAPSULES.
Paul Jamain, Dijon, France.

884. THYMO-CRESOL.
Lawford Bros., Baltimore, Md.

885. CLIMAX INSECT POISON.
Nixon Machine Company, Dayton, Ohio.

886. THORP'S MOTH AND INSECT DESTROYER.
National Disinfectant Manufacturing Company, New York, N. Y.

887. PEROXIDE OF SILICATE.
Peroxide of Silicate Bug Destroying Company, New York, N. Y.

888. BUHACH FLUID COMPOUND.
Redington & Co., San Francisco, Cal.

889. THE ODORLESS BUG KILLER.
Jacob Reese, Philadelphia, Pa.

890. MAGIC MOSQUITO BITE CURE.
Sallade & Co., New York, N. Y.

891. SMITH'S CARBOLIC DISINFECTING POWDER.
C. G. Smith, New York, N. Y.

892. PIERCE'S POTATO BUG KILLER.
Toledo White Lime Company, Toledo, Ohio.

893. VICK'S INSECT POWDER.
James Vick, Rochester, N. Y.

894. WOODBURY TREE CLEANER.
Woodbury Oil Company, San Francisco, Cal.

895. KILLMRIGHT.
Stott Garden Implement Company, New York, N. Y.

896. ATINONNIN.
W. H. Schieffelin & Co., New York, N. Y.

897. ONGERTH'S INSECT POWDER No. 1.
Woodin & Little, San Francisco, Cal.

898. ONGERTH'S INSECT POWDER No. 2.
Woodin & Little, San Francisco, Cal.

899. ONGERTH'S LIQUID TREE PROTECTOR.
Woodin & Little, San Francisco, Cal.

900. SHEEP DIP.
T. W. Lawford, Baltimore, Md.

901. TOBACCO INSECTICIDE SOAP.
Rose Manufacturing Company, New York, N. Y.

902. INSECT LIME.
Ludwig Pohlborn, Berlin, Germany.

903. OIL INSECTICIDE.
George Walker, Jersey City, N. J.

904. FICHER'S WASH FOR APPLE-BORER.

905. ONGERTH'S INSECTICIDE POWDER No. 3.
Woodin & Little, San Francisco, Cal.

906. EXCELSIOR TREE WASH.
I. X. L. Compound Company, San Francisco, Cal.

907. INSECTICIDE EARTH.
J. Walter Wingat, Low Moor, Va.

SECTION 6.—INSECTICIDE APPARATUS.

MANY PUNCTURED NOZZLES.

908. COMMON ROSE NOZZLE.
W. & B. Douglas, Middletown, Conn.

909. REVERSIBLE-FACED ROSE-HEAD.
W. T. Vose, Newton, Mass.

910. FINE SPRAY ROSE.
S. H. Fox, St. Louis, Mo.

911. LEWIS'S INSTANTANEOUS NOZZLE.

DEFLECTOR NOZZLES.

912. ADJUSTABLE DEFLECTOR NOZZLE.
W. & B. Douglas, Middletown, Conn.

913. FLANGED STRAIGHT-FRONT DEFLECTOR NOZZLE.
John Campbell, Selma, Ala.

914. RETRACTILE DEFLECTOR NOZZLE.
F. C. Lewis, Catskill, N. Y.

915. TWO-FLANGED DEFLECTOR NOZZLE.
J. P. Ruhman, Schulenberg, Tex.

916. TRIPLE-JET DIRECT DEFLECTOR NOZZLE—Screw cap.
John Schier, Ellinger, Tex.

917. MANY-JET PROXMIAL DEFLECTOR NOZZLE—Air-chamber cap.
John Schier, Ellinger, Tex.

918. MANY-JET PROXIMAL DEFLECTOR NOZZLE—Air chamber.
John Schier, Ellinger, Tex.

SLOT NOZZLES.

919. FLAT TUBE SLOT NOZZLE.
T. H. Fowler, Oakland, Cal.

920. ADJUSTABLE-LIP SLOT-NOZZLE WITH TRIGGER.
J. P. Ruhman, Schulenberg, Tex.

221. ADJUSTABLE-LIP SLOT-NOZZLE.
J. P. Ruhman, Schulenberg, Tex.

922. ADJUSTABLE-SLOT CAP-NOZZLE.
John Schier, Ellinger, Tex.

923. MILLED PLUG SLOT-NOZZLE.
J. C. Melcher, Black Jack Springs, Tex.

924. L TUBE AND P TUBE SLOT-NOZZLE.
J. C. Melcher, Black Jack Springs, Tex.

925. ADJUSTABLE LIP DIRECT-DISCHARGE SLOT-NOZZLE.
F. A. Helmicke, Round Top, Tex.

926. SEMI-PLUG SLOT-NOZZLE.
F. T. Pinter, Schulenberg, Tex.

THE RILEY OR CYCLONE NOZZLE.

Trial models made in its development.

927. Glass-faced, to show the rotation of the liquid.
928. Deflector with screw-cap.
929. Flattened tube, side discharge.
930. Slot-rim nozzle.
931. Whistle-jet.
932. Side-slot.
933. Rose-rim, one cap.
934. Rose-rim, two caps.
935. Rose-faced, removable base.
936. Removable-faced Rose, lateral view.
937. Removable-faced Rose, front view.
938. Side-faced.
939. With direct discharge.
940. Cone-chamber, side discharge.
941. Side-faced, large discharge.
942. Side-faced, large discharge.

943. Side discharge.
944. Concave faces, side discharge.
945. Oblique-faced, rear discharge.
946. Diagonal-faced.
947. Oblique-faced.
948. Double entrance, side discharge.
949. Screw-cap, direct discharge.
950. Direct discharge.
951. Cone-chambered.
952. Direct-faced, separable parts.
953. Cone-chambered.
954. Cone-chambered, exterior and interior.
955. Cone-chambered, exterior and interior.

CENTRIFUGAL SPRAY NOZZLES.

Riley or Cyclone System.

956. Side-discharge screw-stem.
957. Large direct-discharge.
958. Large side-faced with removable base.
959. Thick-lip small-chamber, large discharge.
960. Side-discharge.
961. Standard size, side-discharge.
962. Large opening, side-discharge.
963. Side discharge screw-stem.
964. Direct discharge.
965. Medium, direct discharge.
966. Standard size, diagonal-faced.
967. With handle or leg.

CENTRIFUGAL SPRAY NOZZLES.

Principal Foreign and Domestic Modifications of the Riley or Cyclone System.

968. VERMOREL NOZZLE—Large hose connections.

969. VERMOREL NOZZLE—Small hose connections.

970. IMPROVED VERMOREL NOZZLE.

971. MARSEILLES NOZZLE.

972. IMPERIAL NOZZLE.

Woodin & Little, San Francisco, Cal.

973. NEW ZEALAND TRIPLET.
Krutzner Bros., New Zealand.

974. JAPY NOZZLE—Modified Vermorel.

975. ALBRAND NOZZLE—Modified Vermorel.

976. UNIVERSAL SPRAY TIP.
Crofton & Green, Walnut Grove, Cal.

977. MYSTERY NOZZLE.
The Deming Company, Salem, Ohio.

978. ACME NOZZLE.
The Deming Company, Salem, Ohio.

979. THE DEMING NOZZLE.
The Deming Company, Salem, Ohio.

DIRECT-DISCHARGE NOZZLES AND MISCELLANEOUS.

980. SPRAY AND SOLID-JET BARREL OR HOSE NOZZLE.
Manufactured in Cincinnati, Ohio.

981. SPRAY AND SOLID-JET BARREL OR HOSE-NOZZLE.
W. M. Clarke, Newark, N. J.

982. YEWELL HOSE-PIPE NOZZLE.
Field Force Pump Company, Lockport, N. Y.

983. THE "BOSS" NOZZLE.
Rumsey & Co., Seneca Falls, N. Y.

984. THE "FAIRY" SPRAY AND SOLID-JET BARREL OR HOSE-NOZZLE.
J. W. Gray, Hartford, Conn.

985. GRADUATING HOSE-PIPE NOZZLE.
Field Force Pump Company, Lockport, N. Y.

986. DIRECT DISCHARGE NOZZLE.
W. Wainright, San Francisco, Cal.

987. THE EUREKA NOZZLE.
W. Wainright, San Francisco, Cal.

988. COLLIDING-JET NOZZLE.
W. Wainright, San Francisco, Cal.

989. COLLIDING-JET NOZZLE.
W. Wainright, San Francisco, Cal.

990. COLLIDING-JET NOZZLE.
National Manufacturing Company, Boston, Mass.

991. THE NIXON NOZZLE, No. 1.
Nixon Nozzle and Machine Company, Dayton, Ohio.

992. RAVENEAU NOZZLE—With lance.
Th. Pilter, Paris, France.

993. THE NIXON NOZZLE, No. 2.
Nixon Nozzle and Machine Company, Dayton, Ohio.

994. THE NIXON NOZZLE, No. 3.
Nixon Nozzle and Machine Company, Dayton, Ohio.

995. THE NIXON NOZZLE, No. 5.
Nixon Nozzle and Machine Company, Dayton, Ohio.

INSECTICIDE MACHINES.

996. VERMOREL KNAPSACK SPRAYER.
V. Vermorel, Villefranche, France.

Diaphragm pump "Eclair."

997. VERMOREL KNAPSACK SPRAYER.
V. Vermorel, Villefranche, France.

With independent syringe pump.

998. VERMOREL KNAPSACK SPRAYER.
V. Vermorel, Villefranche, France.

With suction and force pump.

999. VERMOREL KNAPSACK SPRAYER.
V. Vermorel, Villefranche, France.

1000. NOEL KNAPSACK SPRAYER.
Noel, Paris, France.

1001. BROUQUET KNAPSACK SPRAYER.
Brouquet, Paris, France.

1002. JAPY KNAPSACK SPRAYER.
Japy Frères et Cie., Beaucourt, France.

1003. ALBRAND KNAPSACK SPRAYER.
G. Albrand, Marseilles, France.

1004. PILTER BOURDIL KNAPSACK SPRAYER.
Th. Pilter, Paris, France.

1005. EUREKA SPRAYER.
Adam Weber, Vineland, N. J.

1006. PERFECTED GALLOWAY KNAPSACK SPRAYER.
The Deming Company, Salem, Ohio.

1007. IMPROVED JAPY KNAPSACK SPRAYER.
Robert Leitch & Sons, Washington, D. C.

1008. PERFECTION KNAPSACK SPRAYER.
W. & B. Douglas, Middletown, Conn.

1008*a*. GOULD KNAPSACK PUMP.
The Gould Manuf. Co., Seneca Falls, N. Y.

1009. BUG AND WORM EXTERMINATOR.
S. H. Fox, St. Louis, Mo.

1010. LITTLE CLIMAX TRIPOD PUMP.
Nixon Nozzle and Machine Company, Dayton, Ohio.

1011. LITTLE GIANT ON WHEELS.
Nixon Nozzle and Machine Company, Dayton, Ohio.

1012. STIRRER PUMP.
U. S. Department of Agriculture, Washington, D. C.

With under-spraying attachment.

1012*a*. GOULD'S CLOCK PUMP.
The Gould Manuf. Co., Seneca Falls, N. Y.

1013. BUCKET-AND-BARREL PUMP.
The Deming Company, Salem, Ohio.

1014. GASTINE INJECTOR.
G. Gastine, Paris, France.

For the application of bisulphide of carbon.

1015. AQUANET.
W. & B. Douglas, Middletown, Conn.

1016. SYRINGE PUMP.
W. & B. Douglas, Middletown, Conn.

1017. SYRINGE PUMP.
Rumsey & Co., Seneca Falls, N. Y.

1018. SYRINGE PUMP.
Robert T. Deacon & Co., Philadelphia, Pa.

1019. GARDEN SYRINGE No. 1.
Robert T. Deacon & Co., Philadelphia, Pa.

1020. GARDEN SYRINGE No. 5.
Robert T. Deacon & Co., Philadelphia, Pa.

1021. GARDEN SYRINGE No. 6.
Robert T. Deacon & Co., Philadelphia, Pa.

1022. JOHNSON'S AQUAPULT.
National Manufacturing Company, Boston, Mass.

1023. WOODASON LIQUID SPRAYING BELLOWS.
Thomas Woodason, Philadelphia, Pa.

1024. VERMOREL KNAPSACK POWDER-BLOWER—"La Torpille."
V. Vermorel, Villefranche, France.

1025. MALBEC-GILLOUX POWDER BELLOWS.
Malbec-Gilloux, Paris, France.

Three styles.

1026. THE "FAVORITE" POWDER BELLOWS.
California Bellows Manufacturing Company, San Francisco, Cal.

1027. WOODASON DOUBLE CONE BELLOWS.
Thomas Woodason, Philadelphia, Pa.

1028. WOODASON SINGLE CONE BELLOWS.
Thomas Woodason, Philadelphia, Pa.

1029. PARIS GREEN CAN SIFTER, FOR USE ACAINST POTATO BEETLE.
B. & J. W. Belcher, Chicopee Falls, Mass.

1030. POWDER DISTRIBUTOR.
U. S. Department of Agriculture, Washington.

1031. LEGGETT POWDER GUN.
Leggett & Bro., New York.

With extension tubes.

1032. RICHARDS' DRY-POISON DISTRIBUTOR.
Richards & Co., Lagrange, Texas.

For use against cotton worm.

SECTION 7.—OFFICIAL PUBLICATIONS OF THE U. S. ENTOMOLOGIST.

The entomological publications included in this exhibit do not represent a full list of the reports, bulletins, circulars, etc., issued by the Division of Entomology or by the U. S. Entomological Commission, but only so many of these as are obtainable at the present time. A number of the earlier reports are entirely exhausted, and it was found impossible even to get sample copies for exhibition purposes. Some of the later publications, which are represented in the collection, are also out of print. The collection includes the annual reports of the U. S. Entomologist (author's editions) for the years 1882 to 1891, inclusive; report on the insects injurious to the sugar cane; on insects affecting the orange; catalogue of the New Orleans Exposition; reports on the Horn Fly and on the Ox Bot; circulars 1 and 2; INSECT LIFE, the periodical bulletin of the Division of Entomology, Volumes I to IV, inclusive, with sample copies of Volume V; the bibliography of economic entomology, including the writings of B. D. Walsh and C. V. Riley; report on cotton insects (Comstock); and the following bulletins of the Division of Entomology, Nos. 1 to 30, inclusive, lacking 2 and 3:

(1) Report of Experiments, Chiefly with Kerosene, upon the Insects Injuriously Affecting the Orange Tree and the Cotton Plant.
(4) Reports of Observations and Experiments in the Practical Work of the Division (1884).
(5) Descriptions of North American Chalcididæ, by L. O. Howard.
(6) The Imported Elm Leaf Beetle.
(7) The Pediculi and Mallophaga Affecting Man and the Lower Animals, by Herbert Osborn.
(8) The Periodical Cicada, by C. V. Riley.
(9) The Mulberry Silkworm, by C. V. Riley.
(10) Our Shade Trees and their Insect Defoliators, by C. V. Riley.
(11) Reports of Experiments with Various Insecticide Substances, Chiefly upon Insects Affecting Garden Crops.
(12) Miscellaneous Notes on the Work of the Division of Entomology for the Season of 1885.
(13) Reports of Observations and Experiments in the Practical Work of the Division (1887).
(14) Reports of Observations and Experiments in the Practical Work of the Division (1887).
(15) The Icerya or Fluted Scale.
(16) The Entomological Writings of Dr. Alpheus Spring Packard, by Samuel Henshaw.

(17) The Chinch Bug, by L. O. Howard.
(18) The Life and Entomological Work of the late Townend Glover, by C. R. Dodge.
(19) An Enumeration of the Published Synopses, Catalogues, and Lists of North American Insects.
(20) The Root-knot Disease of the Peach, Orange, and other Plants in Florida, by J. C. Neal.
(21) Report of a Trip to Australia made under the Direction of the Entomologist to Investigate the Natural Enemies of the Fluted Scale, by Albert Koebele.
(22) Reports of Observations and Experiments in the Practical Work of the Division (1890).
(23) Reports of Observations and Experiments in the Practical Work of the Division (1891).
(24) The Bollworm of Cotton, by F. W. Mally.
(25) Destructive Locusts: A Popular Consideration of a Few of the More Injurious Locusts of the United States, by C. V. Riley.
(26) Reports of Observations and Experiments in the Practical Work of the Division (1892).
(27) Reports on the Damage by Destructive Locusts During the Season of 1891.
(28) The More Destructive Locusts of America North of Mexico, by Lawrence Bruner.
(29) Report on the Bollworm of Cotton, by F. W. Mally.
(30) Reports of Observations and Experiments in the Practical Work of the Division (1893).

Publications of the United States Entomological Commission are:

Reports, Volumes I to V, inclusive.

Bulletins 4, 6, and 7 of the Entomological Commission, as follows:

(4) The Hessian Fly, by A. S. Packard, Jr., M. D.
(6) General Index and Supplement to the Nine Reports on the Insects of Missouri, by Charles V. Riley, M. A., Ph. D.
(7) Insects Injurious to Shade and Forest Trees, by A. S. Packard, Jr., M. D.

SECTION 8.—ILLUSTRATIONS, MAPS, CHARTS, ETC.

Figures and Plates from Government Publications.

(1) Illustrations of North American insects, mostly from the reports on the insects of Missouri, from drawings by Dr. C. V. Riley.

Order Hymenoptera, 2 plates; order Coleoptera, 5 plates; order Lepidoptera, 6 plates; order Diptera, 2 plates; orders Neuroptera and Hemiptera, 1 plate; suborder Homoptera, 1 plate; order Orthoptera, 1 plate; Arachnida and Myriopoda, 1 plate; insecticide apparatus, 1 plate; apparatus for collecting and rearing insects, 1 plate 21

(2) Illustrations of North American insects, from Third Report Missouri Botanical Garden, made by or under supervision of Dr. C. V. Riley.

The Yucca moths and Yucca pollination, 2 plates 2

(3) Illustrations of North American insects, mostly from the publications of the Division of Entomology, U. S. Department of Agriculture, made under the supervision of the entomologist.

Order Hymenoptera, 4 plates; order Coleoptera, 6 plates; order Diptera, 3 plates; order Lepidoptera, 9 plates; order Orthoptera, 1 plate; suborder Homoptera, 5 plates; suborder Heteroptera, 1 plate; sericiculture, 1 plate; suborder Parasita, 1 plate; suborder Mallophaga, 1 plate; Acarina and Vermes, 1 plate; original drawings showing method of illustration, 2 plates 35

(4) Illustrations from reports of the U. S. Entomological Commission and Division of Entomology, U. S. Department of Agriculture, insecticide apparatus, 11 plates 11

Grand total of all plates 69

Views of Insecticide Operations and Insect Ravages.

1. Fumigation with hydrocyanic acid gas in California.
2. The Titus fumigator for scale insects.
3. The Culver fumigator for scale insects.
4. Spraying outfit in operation in California—I.
5. Spraying outfit in operation in California—II.
6. Spraying orange trees in Florida.
7. Ravages of Fall Webworm on poplar at Washington, D. C. (showing ravages to poplars on one side of the street and exemption of maples on the other side). I.
8. Ravages of Fall Webworm on poplar at Washington, D. C. (showing ravages to poplars on one side of the street and exemption of maples on the other side). II.

Views: Division of Entomology U. S. Dept. Agric. and Dept. Insects Nat. Mus.

1. General view of insectary—south and east.
2. General view of insectary—north and west.
3. Interior view of insectary.
4. Office of the Entomologist.
5. North or main room Entomological Division.
6. South room of Entomological Division.
7. Balcony of Entomological Division.
8. Main room Department of Insects, U. S. National Museum.
9. Library and work room, U. S. National Museum.

Charts of Important Insects.

1. Round-headed apple-tree borer; Flat-headed apple-tree borer; Cherry-tree borer.
2. Yucca moth.
3. *Pronuba yuccasella.*
4. The Bagworm (*Thyridopteryx ephemeræformis* Steph.)
5. Sarracenia moth (*Xanthoptera semicrocea* Guen.).
6. Archippus butterfly (*Danais archippus* F.).
7. Natural history of Limenitis.
8. The Colorado Potato-beetle (*Doryphora 10 lineata* Say).
9. Sarracenia Flesh-fly (*Sarcophaga sarraceniæ* Riley).
10. The Chinch Bug (*Micropus leucopterus* Say).
11. Oyster-shell Bark-louse (*Mytilaspis pomorum*).
12. Fall Canker-worm (*Anisopteryx pometaria* Harr.).
13. Aldrovanda vesiculosa.
14. Fluted scale on lemon trees in California.
15. Bald-faced Hornet (*Vespa maculata*).
16. *Mytilaspis pomicorticis* Riley.
17. Transformations of the Mosquito (*Culex pipiens*).

Ordinal Charts with Illustrations.

1. Order Hymenoptera.
2. Order Lepidoptera.
3. Order Diptera.
4. Order Aphaniptera.
5. Order Coleoptera.
6. Order Strepsiptera.
7. Order Hemiptera.
8. Order Orthoptera.
9. Order Euplexoptera.
10. Order Neuroptera.
11. Order Trichoptera.
12. Order Thysanoptera.

Maps Showing Range of Important Insects.

1. Approximate Distribution of the Hessian Fly. Prepared by A. S. Packard.
2. Point of Introduction and Subsequent Annual Spread of the Horn Fly (*Hæmatobia serrata*).

3. Territories liable to Destructive Appearances of the Joint Worm (*Isosoma hordei*) and the Wheat Straw Worm (*Isosoma tritici*).
4. Distribution of the Colorado Potato Beetle (*Doryphora decimlineata*) in Injurious Numbers, revised from Potato Pests, by C. V. Riley.
5. Distribution of the Rose-chafer (*Macrodactylus subspinosus*), and the Plum Curculio (*Conotrachelus nenuphar*).
6. Distribution in Injurious Numbers of the Imported Elm Leaf-beetle (*Galeruca xanthomelæna*), and the Sugar Cane and Corn Stalk-borer (*Diatræa saccharalis*).
7. Distribution within the United States and Canada of the Army Worm (*Leucania unipuncta*).
8. Distribution of Clover Leaf Weevil (*Phytonomus punctatus*); Lesser Corn Stalkborer (*Pempelia lignosella*); Southern Buffalo Gnat (*Simulium pecuarum*); San José or Pernicious Scale (*Aspidiotus perniciosus*).
9. Country liable to Injurious Appearances of the Cotton Caterpillar (*Aletia xylina*); the Asparagus Beetle (*Crioceris asparagi*).
10. Distribution of Vegetation with Reference to the Multiplication of and Means of Subduing the Rocky Mountain Locust.
11. Distribution of the Rocky Mountain Locust (*Caloptenus spretus*).
12. Distribution of the Chinch Bug (*Blissus leucopterus*), corrected from Bulletin 5, United States Entomological Commission.
13. The Periodical Cicada, Distribution and Natural Appearance of the different Broods for the next sixteen years. (16 maps.)
14. The Periodical Cicada—Map showing Distribution of the *septendecim* and *tredicim* Races.

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